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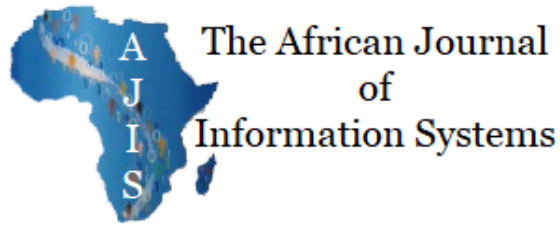
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Challenges and Success Factors of Scaled Agile Adoption – A South African Perspective

Research Paper

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ABSTRACT

Agile methods and Agile scaling frameworks have become a solution for software-developing organizations striving to improve the success of software projects. Agile methods were developed for small projects, but due to their benefits, even large software-developing organizations have adopted them to scale their software projects. This quantitative study was undertaken to deepen the researchers' understanding of the critical success factors and challenges of Scaled Agile from the South African perspective. A simple random sampling method was used. Data was collected with the use of an online structured questionnaire and the response rate was 70%. The results reveal that customer satisfaction remains at the epicenter of adopting Scaled Agile methods. Lack of top management support remains the major challenge in adopting Scaled Agile. The results reveal some notable changes when it comes to the most adopted Agile scaling framework.

Keywords

Scaled Agile, agility, software projects, success factors, challenges.

INTRODUCTION

As organizations have realized that software project investments result in competitive advantage, they have made large investments in software development projects (Musawir et al., 2017; Varajão & Trigo, 2016). However, most of these projects run the risk of being declared unsuccessful by customers because they do not meet the criteria used to measure the success of the project (Imamoglu & Gozlu, 2008; Jugdev & Müller, 2005; Thomas & Fernández, 2008; Varajão & Trigo, 2016). This implies that organizations are not reaping the benefits of their investments. Failed software projects led to the adoption of Agile methods (Gandomani & Nafchi, 2016). The success rate of Agile projects has led organizations to transition from Waterfall methods to Agile methods (The Standish Group, 2014). Agile's success led to the adoption of Scaled Agile across software development organizations (Dikert et al., 2016). Scaled Agile focuses on large projects in large software organizations. Scaling Agile comes

with its own benefits and challenges. Understanding the challenges could assist organizations in focusing on how to overcome some of the challenges in order to benefit fully from the chosen Scaled Agile methods and scaling frameworks.

Many research studies have focused on Agile challenges and success factors in general (Gandomani & Nafchi, 2016; Ghafoor et al., 2017; Inayat et al., 2015). Studies such as those by IQ Business (2019) and VersionOne Inc. (2019) investigated different challenges and success factors of Agile in general and Scaled Agile. Some studies have focused on challenges and success factors specifically of Scaled Agile (Dikert et al., 2016). The studies that have focused on Agile were conducted mostly on continents with developed economies such as Europe, Asia and North America (VersionOne Inc., 2019). VersionOne Inc. (2019) indicates that the adoption of Agile is very minimal on the African continent when compared to continents with developed economies. Therefore, the adoption of Agile methods could be impacted by the developing economies on the African continent. Not very many studies that focus specifically on Scaled Agile have therefore been scientifically studied in-depth from the South African perspective.

This article is structured as follows: the next section provides an in-depth literature review of common Agile scaling frameworks, comparisons of the most adopted Agile scaling frameworks and lastly challenges and success factors of Scaled Agile adoptions. Then follows the section that discusses the research methodology, and the detailed analysis of the results is presented next. The last three sections cover the contributions of the study, the discussion and the conclusion respectively.

LITERATURE REVIEW

There are many definitions for Scaled Agile. Scaled Agile Inc. (2019) defines Scaled Agile as a workflow that guides enterprises intending to scale Lean or Agile methods. In this article, Scaled Agile is defined as a framework that empowers organizations to achieve the benefits of Lean-Agile software development at scale (Leffingwell, 2018). Agile was initially developed for small projects and co-located teams (Dikert et al., 2016). The benefits of Agile adoption, such as flexibility and short delivery times, have led many large organizations to adopt Agile at scale (Paasivaara et al., 2018; Paasivaara & Lassenius, 2016). Many large organizations implement large software projects (Dikert et al., 2016) and it has been proven that large projects are less successful when using the traditional Waterfall method compared to when Agile methods are used (The Standish Group, 2014). The adoption of Scaled Agile has therefore been seen as a possible solution to assist in the success of large projects (Paasivaara et al., 2018). The challenges evident in scaling Agile are different from those of small projects and important lessons from large software projects implemented must be learnt for the success of Scaled Agile adoption (Dikert et al., 2016; VersionOne Inc., 2019). Some of those challenges include the coordination of Agile teams in distributed locations and the lack of up-front architecture or initial system designs that will guide the development team before program implementation is started. A benefit is that team members are able to engage with project stakeholders and this increases the likelihood of project success.

Common Agile Scaling Frameworks

There are different frameworks for scaling Agile, such as RAGE, Spotify, Nexus, Scrum of Scrums, Scaled Agile Framework (SAFe), Large-scale Scrum (LeSS) and Disciplined Agile Delivery (DAD) (Alqudah & Razali, 2016; IQ Business, 2019; Turetken et al., 2017; Vaidya, 2014; VersionOne Inc., 2019). The most commonly used frameworks are SAFe, DAD and LeSS, with SAFe being the most adopted framework (IQ Business, 2019; Paasivaara et al., 2018; Turetken et al., 2017; VersionOne Inc., 2019). Even though SAFe has been considered as a widely used framework to scale Agile (Turetken et al., 2017; VersionOne Inc., 2019), it is complex and not easy to implement (Ebert & Paasivaara, 2017).

The three most often adopted Agile scaling frameworks are adopted to address project management related challenges (Heikkilä et al., 2013). These frameworks are discussed in detail in the next sections.

Disciplined Agile Delivery (DAD)

DAD was introduced to extend the Scrum life cycle incorporating practices from other Agile methods (Alqudah & Razali, 2016). DAD is uniquely identified by its characteristics of being people first, solution-focused Agile values, learning-oriented and focuses on applying these characteristics in a hybrid manner (Brown et al., 2013; Paasivaara & Lassenius, 2016). The team focuses on delivering a quality software product without following repeatable processes (Vaidya, 2014) and by concentrating more on the financial value to the organization (Kersten, 2018). Besides the normal roles, such as product owner, DAD has specific roles such as team lead, specialist, independent tester, technical expert and integrator (Vaidya, 2014). Since DAD is an extension of Scrum, some activities such as daily stand-ups and retrospective activities are the same (Vaidya, 2014). Active team and stakeholder participation is required to guarantee that both the stakeholders and the team have the same understanding of what is expected to be delivered. The focus of DAD is on addressing the entire product life cycle, i.e. the inception phase, the construction phase and the transition phase (Alqudah & Razali, 2016). DAD follows an approach that repeatedly provides solutions which are worth the investment (Brown et al., 2013). It is accomplished in a highly cooperative and well-organized way within an appropriate control framework, while guaranteeing clear delivery of sophisticated solutions to the stakeholder (Ambler & Lines, 2012; Ambler & Lines, 2016).

Large-Scale Scrum (LeSS)

The LeSS framework was first adopted in 2005 with the aim to scale Scrum to big products (Larman & Vodde, 2016). LeSS requires a concrete understanding of how Scrum works within just a single team and then figuring out how to adopt it at scale within the parameters of the Scrum rules and maintaining the same purpose (Paasivaara & Lassenius, 2016). For better results in LeSS adoption, it is critical to ensure that leadership has a good understanding of all the implications and changes of the adoption and also that the organization has managed to adopt Agile successfully on a small scale (Larman & Vodde, 2016). The two forms of LeSS are normal LeSS and LeSS huge, which differ in terms of their Scrum teams (Larman & Vodde, 2016). Normal LeSS can cover up to 10 Scrum teams with 7 people in each team (Larman & Vodde, 2016; Vaidya, 2014). Overall, normal LeSS can accommodate up to 70 people working together to accomplish a similar objective (Alqudah & Razali, 2016). Normal LeSS uses a single product backlog, single product owner and the same definition of done across all Scrum teams to produce a final product after each sprint (Alqudah & Razali, 2016; Paasivaara & Lassenius, 2016). LeSS huge is basically multiple occurrences of normal LeSS implemented concurrently. The product owner manages all features within the product. The team reviews the previous work done before moving to the next sprint review (Larman & Vodde, 2016). In both the normal LeSS and LeSS huge, the regular Scrum meetings last for 15 minutes and the sprint planning and the sprint review last between 2 and 4 hours (Larman & Vodde, 2016). LeSS huge can accommodate up to 1 500 people in multiple sites across the globe (Alqudah & Razali, 2016; Larman & Vodde, 2016) and more than 10 Scrum teams can be covered (Larman & Vodde, 2016; Vaidya, 2014).

Scaled Agile Framework (SAFe)

SAFe has gained more attention from organizations scaling Agile (IQ Business, 2019; VersionOne Inc., 2019). It has been criticized considerably and it has received a great deal of attention by organizations that have seen its benefits (Paasivaara et al., 2018; Turetken et al., 2017). SAFe helps organizations reduce time to market and provides portfolio strategy and investment funding (Alhammedi & Shaalan,

2018; Papadakis & Tsironis, 2018). SAFe 5.0 has three levels, i.e. essential, large solution and portfolio. At the essential level, teams are created consisting of product owners, developers, testers and Scrum masters working to deliver the large solution to the customers. The team is responsible for working on their user stories in the team backlog (Paasivaara et al., 2018; Turetken et al., 2017). The product manager establishes a time-dependent vision so that the entire team is aware of why they are working on a specific product. This vision serves as an input to the program backlog with features to meet both functional and non-functional user stories. The vision will also set a road map to develop a product within the specified time frame within the Agile Release Train (ART) (Paasivaara, 2017). When the ART is completed, the team then releases the Shippable Product Increment (SPI) (Turetken et al., 2017). At the portfolio level, the product portfolio manager (PPM) is tasked to manage the portfolio. The PPM is responsible for the strategic alignment of ideas and governance of the portfolio (Heising, 2012). Metrics such as lean portfolio metrics, portfolio Kanban board and the balanced scorecard are included. Since this is a strategic level where the Lean management competency aligns strategy and execution, metrics are needed for the allocation of funds in different value streams, Agile portfolio operations, governance and ARTs (Leffingwell, 2018; Scaled Agile Inc., 2019). The large solution level is required to guide enterprises and to provide governance when enterprises face difficulties with large solutions that cannot be implemented within a single ART (Leffingwell, 2018).

Comparisons of Agile Scaling Frameworks

The adoption of the three Agile scaling frameworks discussed is not the same. Their adoption is determined by the types and sizes of products to be developed. The focus of DAD, LeSS and SAFe is mostly on software development and these frameworks are adopted mostly by software, financial and insurance companies (Ebert & Paasivaara, 2017). Each framework differs in terms of complexity (Ebert & Paasivaara, 2017; Paasivaara et al., 2018). Since these are all scaling frameworks, they are easy to adapt in different settings but there are issues when the teams are globally distributed. Table 1 presents a comparison of the three most adopted frameworks in detail.

Table 1

Comparisons of Agile Scaling Frameworks (Alqudah & Razali, 2016; Ebert & Paasivaara, 2017; Vaidya, 2014)

Criteria	Agile Scaling Frameworks		
	DAD	LeSS	SAFe
Scope Covered	Software	Software	Software
Differentiator	Complex, with coverage of many models	Provides tractability by offering suggestions	Complex, with many artefacts, roles and guidelines
Underlying Methods and Principles	Scrum, Lean	Scrum	Scrum and other Agile principles, Lean
Adoption	Software, financial, insurance companies and many other companies	Software, financial, insurance companies and many other companies	Software, financial, insurance companies and many other companies
Scaling	Easy to adapt in different settings	Easy to adapt in different settings	Large companies with large products
Complexity level	Medium	Medium	High
Cost	Medium	Medium	High

Criteria	Agile Scaling Frameworks		
	DAD	LeSS	SAFe
Roles	Product owner, team members (technical expert, domain expert), team lead, specialist, independent tester, integrator	Product owner, no special roles	Product owner, product manager, Scrum masters, team members
Phases or Levels	Inception phase, construction phase and transition phase	No phases defined	Essential, large solution and portfolio

Challenges of Scaled Agile Adoption

The introduction and adoption of Scaled Agile frameworks is difficult and sometimes comes with unique challenges (Dikert et al., 2016; Heikkilä et al., 2013; IQ Business, 2019; VersionOne Inc., 2019). It requires a change in the entire organizational culture and top management support is needed (Paasivaara & Lassenius, 2016). In order to deliver quality software projects, a need arises for all team members to understand tasks done by other team members and all approaches implemented to achieve a common understanding in implementing the adopted Scaled Agile framework (Abrantes & Travassos, 2011; Beecham et al., 2014). Human factors cannot be overlooked when implementing Scaled Agile. Agile methods have introduced digital transformation, which is promptly introducing major changes in industries, software development industries included (Kettunen & Laanti, 2017; Uludag et al., 2018). Agile methods have therefore been implemented to address the changes posed by the digital transformation. There are few studies in the South African perspective that have incorporated human factors when implementing Scaled Agile and there is therefore a need for more research in this area (Beecham et al., 2014; Kettunen & Laanti, 2017).

Table 2 illustrates the challenges of Scaled Agile adoption.

Table 2

Challenges of Scaled Agile adoption (Dikert et al., 2016; Heikkilä et al., 2013; IQ Business, 2019; Paasivaara & Lassenius, 2016; VersionOne Inc., 2019)

Challenges	Description
Change Resistance	Both management and employees resist change because of not believing in Agile as the new savior.
Over-Commitment from External Pressure	Customers will request long-term features which may not be available in the new release plan and therefore the team is pressurised to give premature feature commitments.
Balancing between Development Efficiency and Building Generalist Teams	In the case of complicated products, it becomes difficult to manage the team and transfer the knowledge in order to deliver a working product.
Difficulty Managing Non-Feature Work	There are other product management activities such as system documentation, change request and problem reports that are not feature related, more especially with large complex products.
No Proper Investment in Place	Transformation problems become evident in organizations when they do not invest in training and coaching.

Challenges	Description
	Failure to provide funding for training and coaching creates difficulties for organizations in the digital transformation. New tools for Scaled Agile and rearranging physical spaces also needs some investments.
Difficulties in Employing Scaled Agile	The misunderstanding of Agile concepts makes it difficult to apply Scaled Agile in practice.
Coordination Challenges in Multi-Team Environment	Coordination of project team in several team is a challenge to organizations. Independent team model challenging.
Different Approaches Emerge in a Multi-Team Environment	Different approaches cause conflict.
Hierarchical Management and Organizational Boundaries	Boundaries can cause conflicts more especially in large organizations where there is a need for middle management.
Requirements Elicitation Challenges	Management misses the requirements at a higher level. No clear understanding of long- and short-term goals.
Quality Assurance Challenges	Quality assurance affected. Not easy to accommodate all requirement testing.
Incorporating Non-Development Tasks in the Transformation	Not all functions change easily. The pace of delivering cannot be adjusted easily.

The demand for faster product delivery and competition due to digital transformations within organizations calls for organizations to adapt quickly to new ways of working (Dikert et al., 2019; Kettunen & Laanti, 2017). As illustrated in Table 2, resistance to change has been a leading impediment to adopting and scaling Agile (VersionOne Inc., 2019). These challenges if not dealt with might affect the smooth adoption of Agile scaling frameworks within organizations. For the success of a scaled Agile implementation, it is imperative for organizations to understand these challenges and find ways to overcome those challenges.

Success Factors of Scaled Agile Adoptions

Scaled Agile places more emphasis on the competence of IT practitioners, their abilities and skill to communicate and coordinate their teams and tasks and artefacts in software development, and for this reason human factors cannot be overlooked (Beecham et al., 2014). Scaled Agile encourages better communication among team members as the work is divided into small deliverables, allowing the team to engage during daily stand-up meetings (Abrantes & Travassos, 2011; Nazir et al., 2016). Literature indicates that organizations that have adopted Scaled Agile have experienced success factors in their digital transformation. For example, VersionOne Inc. (2019) noted that due to Agile adoption, team morale is improving and therefore there is an increased flexibility and decreased development lead times. Table 3 illustrates the success factors of Scaled Agile adoptions.

Table 3

Success Factors of Large-Scale Agile Adoption (Dikert et al., 2016; Heikkilä et al., 2013; IQ Business, 2019; Paasivaara & Lassenius, 2016; VersionOne Inc., 2019)

Success Factors	Description
Top Management Support	For smooth adoption of Scaled Agile, it is of utmost importance to have full support from management. Top managers play a key role in motivating employees in adapting to new ways of working. Make management support visible. Coach management on Agile.
Increased Team Motivation	All team members are involved through the process of feature planning in early phases and their contributions are welcome in the planning.
Increased Flexibility and Decreased Development Lead Times	Changes take place at any time due to feature development not being linked to any release schedule and this decreases the development lead times.
Commitment to Adjust/Change	Enforce the change to everyone and ensure that everyone is committed.
Choosing and Customizing Agile Method	In the adoption process, it is important for organizations to focus on specific areas and choose specific customised practices to be implemented. Customise the Agile method wisely. Keep everything simple.
Piloting	Start with a pilot to gain acceptance and piloting also help in creating confidence that Agile is working. Gather insights from a pilot.
Training and Coaching	Provide training on Agile methods. Coach teams as they learn by doing.
Engaging People	Engage everyone in the organization to gain acceptance of the digital transformation. Start with Agile supporters. Include people with previous Agile experience.
Communication and Transparency	Communicate the change intensively so that the new way of working can be accepted. Make the change transparent. Create and communicate positive experiences in the beginning.
Mindset and Alignment	Concentrate on Agile values. Arrange social events. Cherish Agile communities. Align the organization.
Team Autonomy	Allow teams to self-organise. Allow grassroots level empowerment.
Requirements Management	Recognise the importance of the product owner role. Invest in learning to refine the requirements.
Increased Flexibility in Choices Made About Work	Teams are flexible to make choices to assist in delivery of the software projects.

The Standish Group CHAOS report alludes to the success of Agile projects (The Standish Group, 2014), leading to many organizations transitioning from traditional to Agile methods and some to Scaled Agile (Dikert et al., 2016; Gandomani & Nafchi, 2016). The literature indicates many organizations facing challenges and some benefiting from success factors when transitioning from traditional to Agile methods (Dikert et al., 2016; Heikkilä et al., 2013; Paasivaara & Lassenius, 2016; IQ Business, 2019; VersionOne Inc., 2019). Most of these studies are not from the South African perspective. There are minimal comprehensive studies that have focused on the challenges and success factors of Scaled Agile from the South African perspective. The challenges and success factors experienced in developed economies might not be the same as those experienced in South Africa. This study focused on the challenges and success factors that South African software development organizations face. This will help to compare and understand the challenges and the success factors of Agile adoption between South Africa and globally. In this study, the aim was to answer the following questions:

- What are the common Agile scaling frameworks adopted in South Africa?
- What are the challenges of Scaled Agile in South Africa?
- What are the success factors of Scaled Agile in South Africa?

RESEARCH METHODOLOGY

This particular study was undertaken to deepen our understanding of the critical success factors and challenges of Scaled Agile from the South African perspective. The study followed a quantitative approach and an online survey was used to collect the quantitative data through a structured questionnaire. The questionnaire comprised three sections, with section A focusing on biographic information, section B on common Agile scaling frameworks and section C on challenges and success factors of Agile scaling frameworks. For the common Agile scaling frameworks, a 5-point Likert scale was used with responses varying between never, rarely, sometimes, often and always. A 5-point Likert scale was used for the challenges and the success factors with responses varying between to no extent, to a small extent, to a moderate extent, to a large extent and to a very large extent.

The results of this article were extracted from the questionnaire that consisted of 65 elements placed in eight questions. However, for the focus of this research study, only 32 elements placed in three questions were tested. A total of 347 responses were received, but only 243 responses were valid. The remaining 104 responses were not complete, and they were not used as part of the data analysis. The response rate was 70%. The fully completed responses were organized into a Microsoft Excel spreadsheet for drawing graphs and SPSS version 26 for statistical manipulation. The population of interest for this research study were IT professionals from organizations pursuing software projects in-house, more especially those involved in Scaled Agile. Since this study was quantitative in nature, probability sampling was deemed suitable and simple random sampling was used. Simple random sampling provides results which are highly generalizable and adequately represent the target population (Blumberg et al., 2011). Table 4 indicates the reliability statistics with a total Cronbach's alpha of 0.853 resulting from the 32 items tested. This is an indication that the items tested were reliable.

Table 4*Reliability Statistics*

Items Tested	Cronbach's Alpha
Common Agile Scaling Frameworks (7 items)	0.652
Challenges (12 items)	0.910
Success Factors (13 items)	0.921
Combined (32 items)	0.853

Validity is the degree to which the instrument measures what it is expected to measure (Field, 2018). The instrument measured what it was supposed to measure and therefore it is considered valid. Construct validity was applied in this study.

RESULTS

There is no difference in the population between the current study and other studies from developed economies except the fact that different IT professionals in developed economies could be exposed to different types and sizes of projects and the experience could also differ. Respondents with 4–7 years of Agile experience were 33.6% of the total respondents. This was the group with the highest number of respondents. These results are equivalent to a study by VersionOne Inc. (2019), which found that Agile specialists with an average of 3-5 years' experience were 34%. Because of the participants' experience in Agile, it can be deduced that their responses can be trusted, and conclusions can be made based on the findings from the collected data. Agile is becoming more popular in software development projects (Abrantes & Travassos, 2011; Paasivaara et al., 2018). The IT sector (78.3%) was dominant in adopting Scaled Agile methodologies followed by the finance sector with 11.5%. Other sectors such as strategic enablement, audit, operations and marketing are slowly adopting Scaled Agile. A total of 34.1% of the participants were Scrum masters and constituted the highest number of respondents' roles. VersionOne Inc. (2019) and IQ Business (2019) also found that the IT sector was dominant in adopting Agile. Respondents in the current study indicated that their organizations had more than 11 active Agile projects (42.4%). This could mean that organizations have more experienced teams working on those projects since they cannot implement them without experienced project teams. Some organizations had been operating for quite some time with 16 years' experience and more (61.8%), working on 11 or more active Agile projects.

Table 5 presents the analysis to determine the correlations between the variables in the biographic information. A Pearson correlation analysis test was performed to determine whether there were any significant relationships between the biographic information variables (experience, active Agile projects and the number of years that the organization had been in business). The p-value is used to determine the significance of the results and there are rules to interpret these values (Fricker Jr et al., 2019; Williamson & Bow, 2002): $r = 0.100$ to 0.290 indicates a small or weak relationship, $r = 0.300$ to 0.490 indicates a medium or moderate relationship, and $r = 0.500$ to 1.000 indicates a large or strong relationship. The following findings were concluded:

- The results indicate that there is a weak positive significant correlation between the respondents' years of experience working with Agile and the number of active Agile projects that the organization had ($r = 0.197$ and $p\text{-value} = .004$). This means that the greater the experience of the people, the higher the number of projects that organizations can implement. There is a moderate positive significant correlation between the number of active Agile projects that the organization had at the present time

and the number of years that the organization had been implementing Agile projects at scale ($r = 0.315$ and $p\text{-value} = 0.000$). This relationship implies that the number of active projects that organizations implement can be influenced by how long the organization has been in business.

Table 5
Biographic Correlations

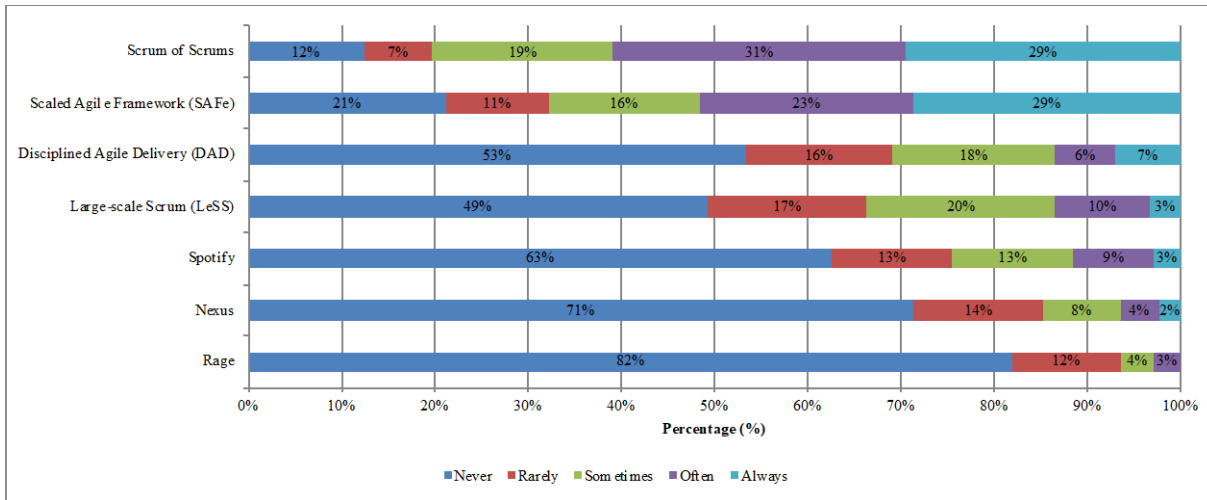
		Number of Active Agile Projects at Present	Number of Years Organization has Been in Business
Number of Years of Experience with Agile	Pearson correlation	.197**	.086
	Sig. (2-tailed)	.004	.206
	N	217	217
Number of Years the Organization has Been in Business	Pearson correlation	.315**	1
	Sig. (2-tailed)	.000	
	N	217	217

** . Correlation is significant at the 0.01 level (2-tailed).

Common Agile Scaling Frameworks

The results indicate that organizations that adopted Scrum of Scrums were 29.5%. The Scrum of Scrums was the Agile scaling framework mostly adopted as per the respondents. There are some notable differences when it comes to the most adopted Scaled Agile frameworks compared to other studies. The findings of this study do not fully support or concur with the findings of other studies. For example, VersionOne Inc. (2019) found that the most adopted scaling framework was SAFe, followed by Scrum of Scrums. IQ Business (2019) found that the most adopted scaling framework was SAFe, followed by DAD. Some studies mentioned that the top three most adopted scaling frameworks were SAFe, DAD and LeSS (Paasivaara et al., 2018; Turetken et al., 2017). There is a slight difference in this study as Scrum of Scrums appears for now to be the most adopted scaling framework. This could mean that due to the complexities posed by SAFe, more organizations are adopting Scrum of Scrums (Paasivaara et al., 2018). Scrum of Scrums is also easy to use in coordinating multiple distributed teams (Shafiq et al., 2019). The top three most adopted Agile scaling frameworks in this study were therefore found to be Scrum of Scrums, SAFe and DAD, in that order. The conclusion could be that there is no one size fits all. Each organization will adopt a scaling framework based on their requirements and what works best for them. Figure 1 shows the statistics on the most adopted Agile scaling frameworks.

Figure 1
Most Adopted Agile Scaling Frameworks



Challenges of Scaled Agile

Organizations that have adopted Scaled Agile have experienced some of the challenges as depicted in Figure 2. The majority of respondents mentioned that delayed or no support at all from high-level management (25.8%) was the biggest challenge that organizations are facing in the Scaled Agile journey. IQ Business (2019) maintains that top management has the responsibility of overcoming challenges to ensure that the team and the entire organization become truly Agile. The delayed support could be due to some organizational cultures that conflict with the Agile culture, resistance to change and inadequate management support (VersionOne Inc., 2019). According to IQ Business (2019) and VersionOne Inc. (2019), all organizational challenges of Scaled Agile adoptions have to be addressed by top management since they remain major obstacles to organizations’ success in scaling Agile. The digital transformation over time poses a slight shift and change in the identified challenges of Scaled Agile. Previous studies mentioned that resistance to change was the top challenge of Scaled Agile (Dikert et al., 2016; Heikkilä et al., 2013; Paasivaara & Lassenius, 2016). The shift or the change in the challenges could be an indication of transformations: as organizations are seeing the benefits of Scaled Agile, they are becoming less resistant to change and new challenges are emerging.

Success Factors of Scaled Agile

Figure 3 illustrates the benefits of Scaled Agile. Team members are able to engage with project stakeholders (19.8%), and this was identified as the top benefit of Scaled Agile. In the process of engaging with stakeholders, the team will be able to manage changing priorities. Studies such as those by VersionOne Inc. (2019) still reveal this as the most important benefit of adopting Agile. The findings of this current study are in line with some benefits of Scaled Agile, with some slight changes when it comes to the order of the benefits. For example, some studies indicate that increased flexibility was the top benefit (Dikert et al., 2016; Heikkilä et al., 2013; IQ Business, 2019; Paasivaara & Lassenius, 2016; VersionOne Inc., 2019), whereas it was at the bottom of the list in this study. This could be an indication that some benefits are no longer the driving forces for organizations to adopt Scaled Agile since new benefits are emerging.

Figure 2
Challenges of Scaled Agile

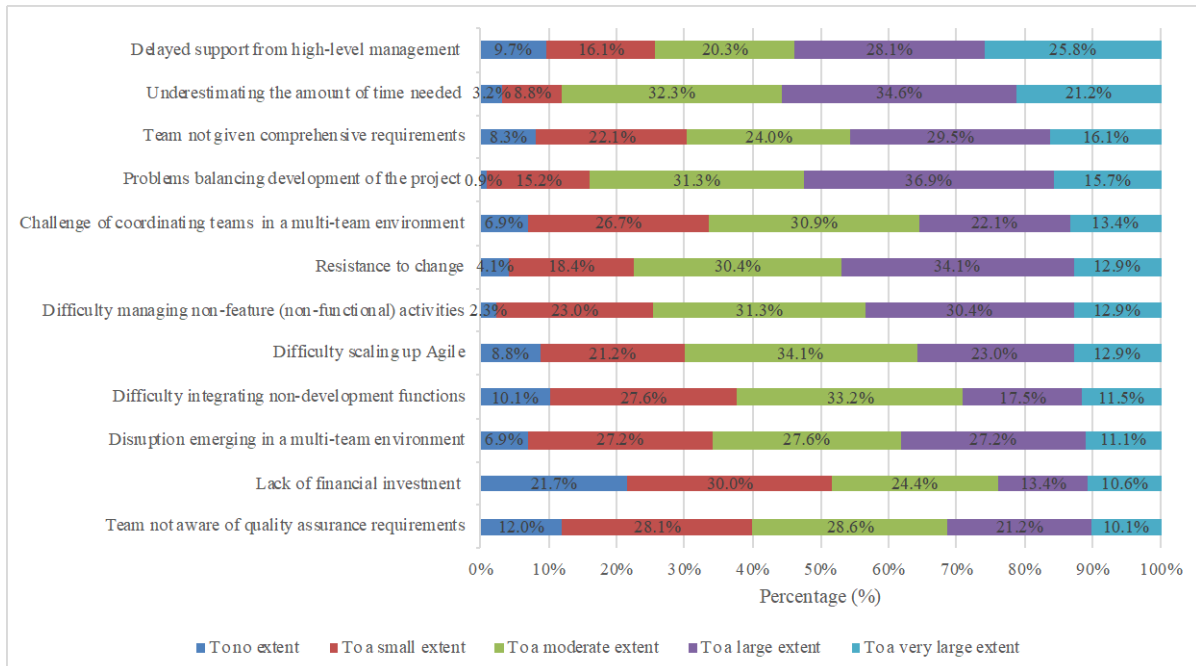
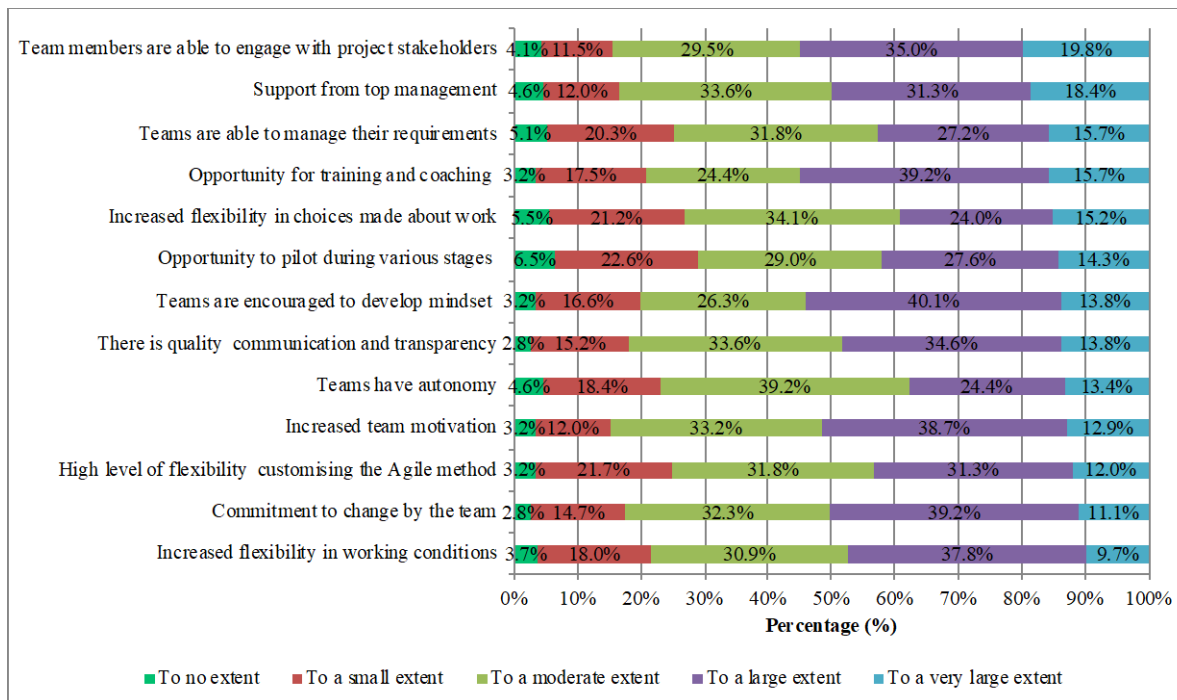


Figure 3
Benefits of Scaled Agile



Weighted Score Prioritizations

A weighted score is used to rank and prioritize features, and it helps sound and efficient decision-making. The weighted score helps to determine and evaluate trends among features (Uhl & Wild, 2009; Wang & Elston, 2007).

The following steps were followed to calculate of the weighted scores:

- **Step 1:** The weighted score was calculated based on the percentage of responses in each category multiplied by the total number of participants.
- **Step 2:** Thereafter, the results of step 1 were multiplied by the value of each category (Very dissatisfied:1, Dissatisfied :2, Neither satisfied nor dissatisfied:3, Satisfied:4, Very Satisfied:5)
- **Step 3:** calculated the sum of the different elements in each category.

Table 6, Table 7 and Table 8 illustrate the weighted scores with colors ranging from green (most important) to red (less important). It can be concluded that Scrum of Scrums is the most adopted Agile scaling framework as illustrated in Table 6. Not much difference is observed between Scrum of Scrums and SAFe. The conclusion is that they are both either the most important or the most adopted Agile scaling frameworks.

Table 6

Weighted Score for the Most Adopted Agile Scaling Framework

Agile Scaling Frameworks	Weighted Score
Scrum of Scrums	777
Scaled Agile Framework (SAFe)	709
Large-Scale Scrum (LeSS)	436
Disciplined Agile Delivery (DAD)	429
Spotify	382
Nexus	330
Rage	276

There are slight changes in the order of the challenges from previous studies. Even though underestimating the amount of time needed was not the top challenge as depicted in Figure 2, it is the most critical challenge as illustrated by the weighted scores in Table 7. The significant changes in the order highlight some notable differences.

Table 7

Weighted Score for Scaled Agile Challenges

Challenges of Scaled Agile	Weighted Score
Underestimating the Amount of Time Needed	785
Problems Balancing Development of the Project	762

Challenges of Scaled Agile	Weighted Score
Delayed Support from High-Level Management	747
Resistance to Change	723
Difficulty Managing Non-Feature (Non-Functional) Activities	713
Team Not Given Comprehensive Requirements	701
Difficulty Scaling Up Agile	673
Disruption Emerging in a Multi-Team Environment	669
Challenge of Coordinating Teams in a Multi-Team Environment	669
Difficulty Integrating Non-Development Functions	635
Team Not Aware of Quality Assurance Requirements	628
Lack of Financial Investment	567

The top benefit of Scaled Agile in the weighted score table (Table 8) remains the same as in Figure 3. Increased team motivation and teams being encouraged to develop mindset were at the bottom of the list of benefits in Figure 3, but from Table 8 they are now in the top five benefits.

Table 8

Weighted Score for Scaled Agile Benefits

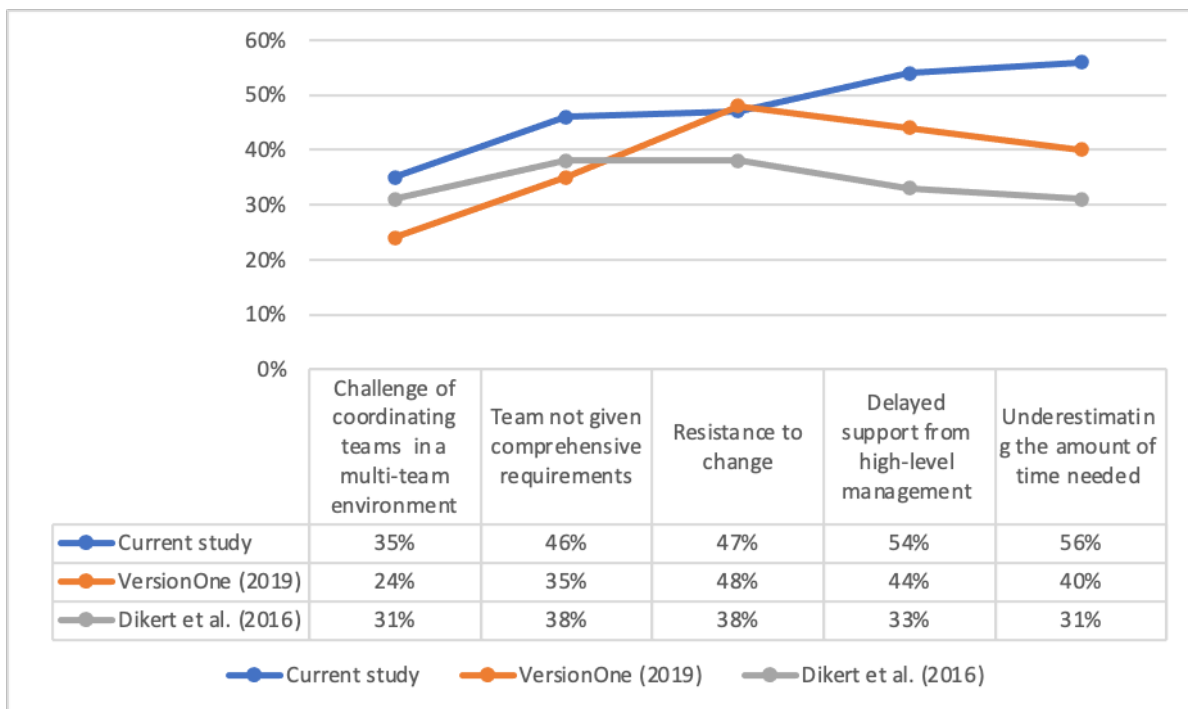
Benefits of Scaled Agile	Weighted Score
Team Members are Able to Engage with Project Stakeholders	770
Support from Top Management	753
Opportunity for Training and Coaching in Implementation	752
Increased Team Motivation	751
Teams are Encouraged to Develop Mindset	748
There is Quality Communication and Transparency	741
Commitment to Change by the Team	740
Increased Flexibility in Working Conditions	720
Teams are Able to Manage their Requirements	712
High Level of Flexibility Customizing the Agile Method	710
Teams Have Autonomy	702
Increased Flexibility in Choices Made About Work	699
Opportunity to Pilot During Various Stages of Implementation	696

CONTRIBUTIONS OF THE ARTICLE

As discussed in the introduction, this study contributes to the current body of knowledge. It is therefore imperative to compare this current study with notable studies that highlighted significant findings with regard to challenges and benefits of Scaled Agile. This current study was compared with VersionOne Inc. (2019) and Dikert et al. (2016) to determine its significance and contribution to the body of knowledge. Figure 4 highlights the common challenges of Scaled Agile between this current study and other studies. These challenges are taken from VersionOne Inc. (2019) and Dikert et al. (2016) and

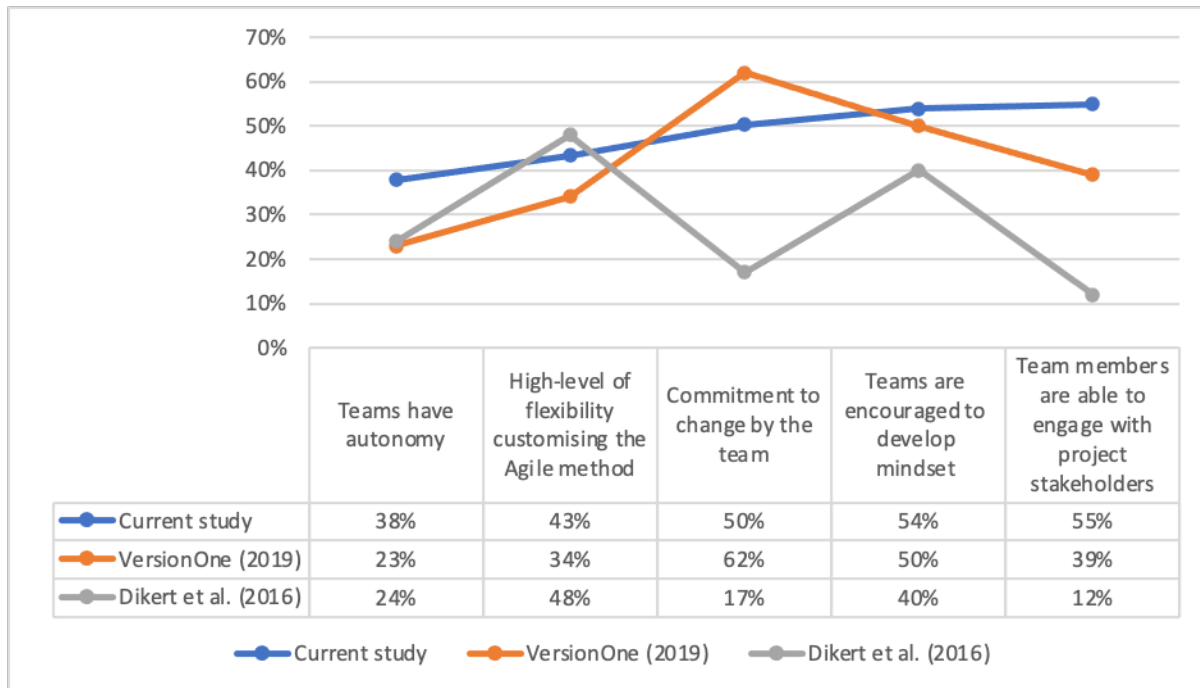
mapped with the challenges depicted in the current study. The objective was to determine the trend among the challenges. It is clear from the results that four of the top five challenges from other studies are also part of the current study's challenges excluding resistance to change. The results indicate that organizations are increasingly facing challenges while adopting Scaled Agile. This means that even though different studies have been conducted on the challenges of Scaled Agile adoption, there is no single solution benefiting organizations on how to manage those challenges. Since some of the challenges are now known to organizations, the call is then for researchers to investigate ways to manage and handle those known challenges so that organizations are not affected when it comes to project success.

Figure 4
Challenges of Scaled Agile – Comparisons with Previous Studies



Similarly, Figure 5 highlights the common benefits of Scaled Agile between the current study and other studies. These benefits are taken from VersionOne Inc. (2019) and Dikert et al. (2016) and mapped with the benefits depicted in the current study. The objective was to see the trend among the benefits. It is clear from the results that organizations are experiencing different benefits over time. Interestingly, organizations are continuously experiencing the benefits of adopting Scaled Agile. The increase in the benefits experienced should be an indicator to other organizations that Scaled Agile is indeed a solution, particularly if these benefits are what they expect. Compared to previous studies, organizations keep on improving the benefits. Since the goal of digital transformation and the adoption of Scaled Agile is to improve project success (Kettunen & Laanti, 2017), it is therefore envisaged that project success should also increase based on these benefits but further investigations in this regard are necessary.

Figure 5
Benefits of Scaled Agile – Comparisons with Previous Studies



DISCUSSION

In this paper, challenges and benefits of Scaled Agile adoptions were identified. It is evident that there are some notable differences and similarities with regard to the findings compared to previous research. The weighted score was used to prioritize both the challenges and the benefits in order to help software organizations evaluate trends in the challenges and the benefits they are experiencing. Previous studies found that resistance to change was the major challenge in Scaled Agile adoption. However, this current study found resistance to change is no longer the top challenge to scaled Agile adoption. It is therefore assumed that since organizations have now seen the benefits of adopting Scaled Agile for their software project success, they are becoming less resistant to change. The main issue is now delayed support from top management. In terms of benefits, it was highlighted that teams are able to engage with project stakeholders and, according to the Agile Manifesto, individual interactions are key for the success of software projects. Most studies have investigated the success factors and the challenges of Agile in general, whereas this article presents scientific results focusing on scaling Agile from the South African perspective. With the use of the weighted score, this article presents results that could help organizations to prioritize and focus more on the challenges and success factors that are most dominant in their software projects. Since previous studies found SAFe to be the most adopted scaling framework (IQ Business, 2019; Paasivaara et al., 2018; Turetken et al., 2017; VersionOne Inc., 2019), the challenges and the success factors discussed by most studies were based mostly on SAFe. However, this article presents the challenges and the success factors that are mostly experienced when implementing Scrum of Scrums, since this was found to be the most adopted Agile scaling framework. In terms of challenges, the current study as compared to international studies indicates that South African software organizations are more challenged except with resistance to change where results indicate similar trends irrespective of whether it is developed or developing economies. Similarly, South African software

development organizations are experiencing similar but larger benefits compared to international studies, with some exceptions like commitment to change by the team.

CONCLUSION

Organizations are striving to accelerate the delivery of their software projects. Since software development organizations implement large software projects, it is imperative that these organizations implement Scaled Agile frameworks as these are suitable for large software projects. The use of Scaled Agile frameworks comes with different challenges and benefits. The literature has discussed the most adopted Agile scaling frameworks, as well as the challenges and the success factors experienced when implementing Scaled Agile. Software development organizations are adopting Scaled Agile in order to experience the benefits brought by these frameworks so that they can remain relevant in the changing marketplace and also achieve their competitive advantage.

The challenges experienced by software development organizations are basically because there is delayed support from top management to adopt Scaled Agile. Since getting the development teams to be Agile is easy, the challenge is getting the software organizations at large to embrace agility across value streams, and this is because top management lacks skills and understanding to embrace agility. The benefits of Scaled Agile should be customer-centric since the customer remains at the heart of the Agile Manifesto. Any Scaled Agile benefits should drive customer satisfaction as this is the highest priority of the Agile Manifesto.

The research results reveal certain familiar trends and a couple of notable changes. Scrum of Scrums is considered the most commonly used Agile methodology, whereas previous studies reported that SAFe was the most adopted Scaled Agile framework. Due to the complexities posed by SAFe, it is advisable for software companies to adopt Scrum of Scrums to see how they can benefit from it. The IT sector still leads in the adoption of Scaled Agile, followed by financial institutions. Top management support remains the major challenge in Scaled Agile adoption.

Since top management support remains the major challenge (Dikert et al., 2016; Heikkilä et al., 2013; IQ Business, 2019; Paasivaara & Lassenius, 2016; VersionOne Inc., 2019), future research study could focus on how to improve top management's understanding of Scaled Agile and how Agile scaling frameworks can improve organizations' software project delivery and success. Another possible future study could focus on the relationships between the Scaled Agile challenges, benefits and project success to determine whether organizations' project success is improving as they improve their benefits.

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