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Research Article

SAFe® - Lean Map: A Systematic Mapping Study between SAFe® and Lean Production

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Abstract – Scaled Agile Framework® (SAFe®), one of the recent agile frameworks, aims to spread agile methods across organizations as many other large-scale frameworks. Featured with strongly documented standards, flows, and release trains at different levels which synchronize different teams and groups of teams, the framework has been among the most preferred methodologies for the last few years in terms of usage volume. Through case studies and experiences of practitioners in the academic literature, the framework has evolved over the years and has reached version 6.0. Many upgrades have been committed to including strategic patterns, budgeting, portfolio management, value streams, several configurations for framework setup, and a lean quality mindset. The fact that the leading concept in recent versions is "lean" requires questioning the relationship between the Toyota Way (TW) and Total Quality Management (TQM). In this study, a systematic review of the relationship between SAFe and lean production (LP) was conducted in the first stage by taking base of a ready characteristic set of LP, then terminological mappings were tried to be found by conducting separate reviews for each lean production sub-element. The resulting set can be used as input in subsequent studies and can lead the way to the detailed stage.

Keywords – Scaled Agile Framework, Large Scale Agile, Total Quality, Toyota Way, Lean

I. INTRODUCTION

The last widespread evolution of the software world was the transition from traditional to agile methods. The iterative cycles of agile methods, which respond much faster to customer demand, have also helped to stabilize employee capacity. As the agile approach became widespread, many large organizations that had difficulties with traditional methods started to experiment with agile methods and the results of the experience were reflected in academic and gray literature. As the organization grew, the increasing number of teams, work distribution, scheduling, deployment, financial, and portfolio issues created many problems in the atomic applications of agile methods; these problems led to the birth of large-scale agile frameworks. As seen in the 17th State-of-Agile report, the most widely used large-scale agile framework, SAFe, has built many structural elements for the spread of agile in organizations, technical communication between teams, and work synchronization. In light of the experiences gained, in the updates added in the latest versions, the framework has emphasized lean thinking and has included

processes to activate the functionality of quality focus and Plan-Do-Check-Act (PDCA) cycles. When the motivation, gains, and challenges conveyed in many different academic studies are examined, the extent to which the framework overlaps with the concept of lean production, which is the application layer of lean thinking, has created a need for questioning. In this sense, in the first part of the study, a systematic literature review is conducted to examine the studies on this relationship, and then, based on the components of lean production, it is questioned how much terminological-textual matching is found in SAFe by scanning on the basis of each component.

II. Materials and Method

This study starts a terminological comparison between SAFe elements and lean production elements, to open further study points for researchers. A main systematic literature review (SLR) is run for related similar studies; after completing material gathering, for each LP component specific literature scanning is implemented for possible terminological matches. At the output, there is a result table including references and a study map for a detailed examination of SAFe and LP elements.

III. A Large-Scale Agile Framework: SAFe®

Agile Manifesto has been declared among agile gurus of the current time and created a vision for iterative and customer-focused thinking. The early period agile methods were born as Extreme Programming (XP), Feature Driven Development (FDD), Lean Software Development (LSD), Crystal, and many others; followed by large-scale frameworks SAFe, Disciplined Agile Delivery (DAD), Large Scale Scrum (LeSS), Nexus, Spotify and Scrum@Scale (S@S). SAFe framework, where a wide process lifecycle exists, is known as the favorite large-scale framework according to the 17th State-Of-Agile report.

SAFe has implemented PDCA implementation of Deming in many value streams and flows. Having a value-driven lifecycle, streams have been built widely such as business agility value stream (BAVS), development (DVS), and operational value streams (OVS). The living assets of streams are flows, and flows are configured to be used by choice according to organization size or requirements, where configuration term comes up. A very big organization may need portfolio-based tracking, then it should use the full configuration of SAFe, but two or three small groups of agile teams may continue with a simple Agile Release Train (ART) flow and exclude others.

Under configurations, flows are available to handle development & knowhow facilities, such as Portfolio Flow (PF), Solution Train (ST) flow, ART flow and finally Coaching Flow (CF); combined with responsible roles like Release Train Engineer (RT) or Solution Train Engineer (STE).

From the starting point of the customer need to the endpoint of software delivery, flow occurs as below in a full configuration.

Table 1. The Summary of Flow at Full Configuration on SAFe

SAFe Component	Description
BAVS	Customer opportunity is detected and funding decisions are made, a customer PDCA cycle begins
PF	Opportunity comes as a possible deliverable software asset and enters to portfolio, funded by participatory budgeting, a portfolio flow begins
ST Flow	Parted as the solution, the solution train combines multiple agile release trains and an inner big PDCA cycle begins
ART Flow	Multiple agile teams are merged in agile release trains to coordinate in terms of release
Agile Teams	Scrum or Kanban teams running through WIP backlogs or Kanban, working on tasks passing from upper stream, flow, and trains.

Large organizations have a naturally vast number of departments or domains, which means in order to maintain communication and synchronization between leveled assets mentioned in Table 1, there have been cyclic meetings in SAFe, like Program Increments, Innovation Planning, Inspect & Adapt, and many others. Leadership motivation and involvement have been required and matched with Lean-Agile leadership covered in core values, principles, and inner components. A big core competency map is also written in detail, to cover business agility across over organization.

IV. MATERIAL OF MAPPING

To start a terminological comparison, in two sides of comparison, it is required to determine materials of both LP and SAFe framework. Two groups are described below.

A. *Elements of Lean Production*

LP has a large history starting from Toyota to many case studies and normally has a considerable number of academic studies due to the implementation period and success of lean production in its own market. LP is strongly bound with TW, Toyota Production System (TPS), Lean Thinking, and finally most generic one, TQM as described in ISO 9001:2015 standard.

A further study may traverse all past studies and merge them to cover any elements of LP; this study is based on the wide terminological scanning study of Pettersen [1] for lean production definition and elements.

B. *Elements of SAFe® Framework*

The SAFe framework has been versioned as 6.0 and possibly will continue to new versions. From a 6.0 perspective, most detailed information has been found on wide official website documentation for 6.0, official books for 5.0 and 4.5, and academic resources for all versions in a limited number. That gives researchers a direction on web documentation as a main source and additionally academics; also focus case study papers & conference papers for experimental trials and results.

V. SYSTEMATIC LITERATURE REVIEW

With not just searching about direct terms, this study searches literature with also possibly related terms like total quality.

Table 2. SLR OF SAFE – Lean Relation

("scaled agile") AND ("quality" OR "kaizen" OR "process improvement" OR "TQM" OR "Total Quality Management" OR "Toyota Way" OR "continuous improvement" OR "lean")			
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**
ScienceDirect	273	2	2
IEEE	25	6	0
SpringerLink	307	20	8
Wiley	74	8	3
	679	**36**	**13**

As a result of the full text review, there was no article related with one-to-one SAFe and lean conjunction, but a strongly related article was the Lean Gap, assessing large scales and lean conjunction with survey-based methods. That study is useful at covering and making benefits at describing possible relations.

VI. RESULTS AS TERMINOLOGICAL MAPPING OF ELEMENTS

Each component described in the base study[1] is queried with parameters from sub-components of the main ones.

A. *Just-In-Time Practices*

Table 3 shows the research publications produced in the areas of the relationship between SAFe and JIT practices.

Table 3. Query Results of SAFe - JIT Practices

("scaled agile framework") AND ("just in time" OR "just-in-time" OR "production leveling" OR "heijunka" OR "pull system" OR "kanban" OR "takt" OR "process synchronization")				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	79	2	0	-
IEEE	0	0	0	-
SpringerLink	23	2	0	-
Wiley	34	2	1	[2]
	136	**6**	**1**	

B. *Resource Reduction*

Table 4 shows the research publications produced in the areas of the relationship between SAFe and resource reduction.

Table 4. Query Results of SAFe - Resource Reduction

("scaled agile framework") AND (“lot” OR “waste” OR “setup time” OR “lead time” OR “inventory”)				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	52	0	0	-
IEEE	4	1	0	-
SpringerLink	368	2	0	-
Wiley	35	0	0	-
	459	**3**	**0**	

C. *Human Relations Management*

Table 5 shows the research publications produced in the areas of the relationship between SAFe and HRM practices.

Table 5. Query Results Of Safe - HRM

("scaled agile framework") AND ("team organization" OR "cross training" OR "employee involvement" OR “teamwork” OR “employee” OR “training”)				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	65	2	2	[3], [4]
IEEE	11	3	8	[5], [6], [7], [8], [9], [10], [11], [12]
SpringerLink	503	2	2	[13], [14]
Wiley	49	1	0	-
	628	**8**	**12**	

D. *Improvement Strategies*

Table 6 shows the research publications produced in the areas of the relationship between SAFe and improvement.

Table 6. Results Of SAFe - Improvement Strategies

("scaled agile framework") AND (“improvement circle” OR “kaizen” OR “continuous improvement” OR “5 why” OR “5-why” OR “root cause analysis”)				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	79	2	1	[15]
IEEE	0	0	0	-
SpringerLink	72	0	2	[16], [17]
Wiley	23	0	2	[18], [19], [20]
	174	**2**	**5**	

E. *Defects Control*

Table 7 shows the research publications produced in the areas of the relationship between SAFe and defect control.

Table 7. Query Results Of SAFe - Defects Control

("scaled agile framework") AND (“autonomation” OR “jidoka” OR “prevention” OR “pokayoke” OR “poka-yoke” OR “poka yoke” OR “gemba” OR “genba” OR “andon”)				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	4	0	1	[15]
IEEE	0	0	0	-

SpringerLink	8	0	0	-
Wiley	8	0	3	[18], [21], [22]
	20	**0**	**4**	

F. *Supply Chain Management (SCM)*

Table 8 shows the research publications produced in the areas of the relationship between SAFe and the supply chain.

Table 8. Query Results Of SAFe - SCM

("scaled agile framework") AND (“value stream” OR “flowchart” OR “supplier involvement” OR “supplier participation”)				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	16	0	4	[15], [23], [24], [25]
IEEE	12	2	12	[5], [6], [9], [10], [26], [27], [28], [29], [30], [31], [32], [33]
SpringerLink	14	1	2	[34], [35]
Wiley	17	0	7	[2], [36], [37], [38], [39], [40], [41]
	59	**3**	**25**	

G. *Standardization*

Table 9 shows the research publications produced in the areas of the relationship between SAFe and standardization.

Table 9. Query Results Of SAFe - Standardization

("scaled agile framework") AND (“housekeeping” OR “5S” OR “standardized” OR “visualization”)				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	45	0	13	[15], [23], [24], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51]
IEEE	1	0	1	[10]
SpringerLink	133	0	1	[52], [53], [54], [55]
Wiley	23		5	[2], [18], [22], [39], [56]
	202	**0**	**20**	

H. *Scientific Management*

Table 10 shows the research publications produced in the areas of the relationship between SAFe and JIT practices.

Table 10. Query Results of Safe - Scientific Management

("scaled agile framework") AND ("hoshin" OR "kanri" OR "policy deployment" OR "multimanning" OR "workforce reduction" OR "cellular manufacturing")				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	0	0	0	-
IEEE	0	0	0	-
SpringerLink	0	0	0	-
Wiley	0	0	0	-
	0	**0**	**0**	

İ. *Bundled Techniques*

Table 11 shows the research publications produced in the areas of the relationship between SAFe and JIT practices.

Table 11.Query Results Of SAFe - Bundled Techniques

("scaled agile framework") AND ("SQC" OR "TPM")				
Query Source	**Query results**	**Filter by Metadata & Abstract**	**Filter by Full-Text Reading**	**Studies**
Science Direct	0	0	0	-
IEEE	0	0	0	-
SpringerLink	3	0	0	-
Wiley	0	0	0	-
	3	**0**	**0**	

VII. DISCUSSION

After evaluating 1678 studies and full reading on 83 of them, results have shown that according to the numbers of matched categories, supply chain management subjects such as value streams, and supplier participation are mostly investigated, with 25 studies. Standardization and human relation elements have been followed by 20-12 studies sequentially. That may intersect with the main points of Toyota Way [57], where respect for people, suppliers, and the ground on Toyota House has been built [57]. The Just-in-time (JIT) header is the main column of the same house whereas another column is Jidoka & autonomation. There may be a reason for finding a low-frequency number on JIT, because of its implementation based on Agile practices, the core of SAFe framework. The same manner exists in improvement strategies, where Kaizen culture is the other main point of Toyota Way [57], where intrinsic motivation of employees was born; and SAFe framework has dedicated meetings and teams for innovation [58], [59], [60]. Resource reduction, defects control, scientific management and bundled techniques need more data, especially all initial textual/terminological search here required too.

VIII. LIMITATIONS

This study has an attitude to approach to terminology first and create open literature doors for future studies. So, a textual match is being studied over studies by fully reading the main text. For example, a study in a different subject has been detected in literature scans as TPM but this time with the abbreviation for Tile Processing Module; so, it was discarded when querying with TPM as Total Productive Maintenance of Toyota Way. The academic strategy here is preparing the environment for an updated, qualified, and detailed comparison for SAFe and also an initiative for other large-scale agile frameworks. Each element in the study is ready for next studies individually.

IX. CONCLUSION

The agile approach has been growing vastly, in short periods several frameworks have been created and documented. In the literature, there have been studies focusing on the benefits and challenges of agile transformations. Noticeable transformation failure rates can be traced from surveys of consultancy companies on Agile, also many success stories can be accessed via academic and grey literature. From the results of study, focus points of merging lean on agile methods can be evaluated with study counts as quantitively. A general detailed study may be useful for a deep dive into all characteristics, then studies can be started on each characteristic individually. Also, open study points are presented overall academic waiting with an empiric behavior.

REFERENCES

[1] J. Pettersen, "Defining lean production: some conceptual and practical issues," The TQM Journal, vol. 21, no. 2, pp. 127–142, Jan. 2009, doi: 10.1108/17542730910938137.

[2] M. O. Ahmad, L. E. Lwakatare, P. Kuvaja, M. Oivo, and J. Markkula, "An empirical study of portfolio management and Kanban in agile and lean software companies," Journal of Software: Evolution and Process, vol. 29, no. 6, p. e1834, 2017, doi: 10.1002/smr.1834.

[3] J. Sithambaram, M. H. N. B. M. Nasir, and R. Ahmad, "Issues and challenges impacting the successful management of agile-hybrid projects: A grounded theory approach," International Journal of Project Management, vol. 39, no. 5, pp. 474–495, Jul. 2021, doi: 10.1016/j.ijproman.2021.03.002.

[4] F. Spychiger, M. Lustenberger, J. Martignoni, L. Schädler, and P. Lehner, "Organizing projects with blockchain through a decentralized autonomous organization," Project Leadership and Society, vol. 4, p. 100102, Dec. 2023, doi: 10.1016/j.plas.2023.100102.

[5] K. M. Nyandongo and M. G. Madumo, "The adoption of the Scaled Agile Framework (SAFe) in non-agile organizations," in 2022 IEEE 28th International Conference on Engineering, Technology and Innovation (ICE/ITMC) & 31st International Association For Management of Technology (IAMOT) Joint Conference, Jun. 2022, pp. 1–8. doi: 10.1109/ICE/ITMC-IAMOT55089.2022.10033246.

[6] U. Ameta, M. Patel, and A. K. Sharma, "Scaled Agile Framework Implementation in Organizations', its Shortcomings and an AI Based Solution to Track Team's Performance," in 2022 IEEE 3rd Global Conference for Advancement in Technology (GCAT), Oct. 2022, pp. 1–7. doi: 10.1109/GCAT55367.2022.9971968.

[7] P. Ciancarini, A. Kruglov, W. Pedrycz, D. Salikhov, and G. Succi, "Issues in the adoption of the scaled agile framework," in Proceedings of the 44th international conference on software engineering: software engineering in practice, 2022, pp. 175–184.

[8] M. Paasivaara, "Adopting SAFe to scale agile in a globally distributed organization," in 2017 IEEE 12th International Conference on Global Software Engineering (ICGSE), IEEE, 2017, pp. 36–40.

[9] M. A. Razzak, I. Richardson, J. Noll, C. N. Canna, and S. Beecham, "Scaling agile across the global organization," in Proceedings of the 13th International Conference on Global Software Engineering, New York, NY, USA: ACM, May 2018, pp. 121–130. doi: 10.1145/3196369.3196373.

[10] C. Fagarasan, C. Cristea, M. Cristea, O. Popa, C. Mihele, and A. Pisla, "The delivery of large-scale software products through the adoption of the SAFe framework," in 2022 International Conference on Development and Application Systems (DAS), May 2022, pp. 137–143. doi: 10.1109/DAS54948.2022.9786216.

[11] S. M. Faizi, S. Rahman, and K. Hopkins, "Implementing Large Enterprise Resource Planning Systems with Agile Methods," in 2019 2nd International Conference on Innovation in Engineering and Technology (ICIET), Dec. 2019, pp. 1–6. doi: 10.1109/ICIET48527.2019.9290587.

[12] Ö. Uludağ, M. Kleehaus, N. Dreymann, C. Kabelin, and F. Matthes, "Investigating the Adoption and Application of Large-Scale Scrum at a German Automobile Manufacturer," in 2019 ACM/IEEE 14th International Conference on Global Software Engineering (ICGSE), May 2019, pp. 22–29. doi: 10.1109/ICGSE.2019.00019.
[13] A. Putta, M. Paasivaara, and C. Lassenius, "Benefits and challenges of adopting the scaled agile framework (SAFe): preliminary results from a multivocal literature review," in Product-Focused Software Process Improvement: 19th International Conference, PROFES 2018, Wolfsburg, Germany, November 28–30, 2018, Proceedings 19, Springer, 2018, pp. 334–351.
[14] S. Theobald and A. Schmitt, "Dependencies of Agile Teams – An Analysis of the Scaled Agile Framework," in Agile Processes in Software Engineering and Extreme Programming – Workshops, M. Paasivaara and P. Kruchten, Eds., Cham: Springer International Publishing, 2020, pp. 219–226. doi: 10.1007/978-3-030-58858-8_22.
[15] B. Fitzgerald and K.-J. Stol, "Continuous software engineering: A roadmap and agenda," Journal of Systems and Software, vol. 123, pp. 176–189, Jan. 2017, doi: 10.1016/j.jss.2015.06.063.
[16] L. Traini, "Exploring Performance Assurance Practices and Challenges in Agile Software Development: An Ethnographic Study," Empir Software Eng, vol. 27, no. 3, p. 74, Mar. 2022, doi: 10.1007/s10664-021-10069-3.
[17] Ö. Özcan-Top and F. McCaffery, "To what extent the medical device software regulations can be achieved with agile software development methods? XP—DSDM—Scrum," J Supercomput, vol. 75, no. 8, pp. 5227–5260, Aug. 2019, doi: 10.1007/s11227-019-02793-x.
[18] S. Sreenivasan and K. Kothandaraman, "Improving processes by aligning Capability Maturity Model Integration and the Scaled Agile Framework®," Global Business and Organizational Excellence, vol. 38, no. 6, pp. 42–51, Sep. 2019, doi: 10.1002/joe.21966.
[19] M. Kowalczyk, B. Marcinkowski, and A. Przybyłek, "Scaled agile framework. Dealing with software process-related challenges of a financial group with the action research approach," Journal of Software: Evolution and Process, vol. 34, no. 6, Jun. 2022, doi: 10.1002/smr.2455.
[20] J. Vance, H. Chung, and E. Hoeppner, "Clean Energy and The Need for Effective Transformation and Continuous Improvement," Climate and Energy, vol. 37, no. 12, pp. 20–25, 2021, doi: 10.1002/gas.22238.
[21] N. Rashid and S. U. Khan, "Agile practices for global software development vendors in the development of green and sustainable software," Journal of Software: Evolution and Process, vol. 30, no. 10, p. e1964, 2018, doi: 10.1002/smr.1964.
[22] B. Ozdenizci Kose, "Business process management approach for improving agile software process and agile maturity," Journal of Software: Evolution and Process, vol. 33, no. 4, p. e2331, 2021, doi: 10.1002/smr.2331.
[23] C. Marnewick and A. L. Marnewick, "Benefits realisation in an agile environment," International Journal of Project Management, vol. 40, no. 4, pp. 454–465, May 2022, doi: 10.1016/j.ijproman.2022.04.005.
[24] R. Kasauli, E. Knauss, J. Horkoff, G. Liebel, and F. G. de Oliveira Neto, "Requirements engineering challenges and practices in large-scale agile system development," Journal of Systems and Software, vol. 172, p. 110851, Feb. 2021, doi: 10.1016/j.jss.2020.110851.
[25] C. J. Stettina and J. Hörz, "Agile portfolio management: An empirical perspective on the practice in use," International Journal of Project Management, vol. 33, no. 1, pp. 140–152, Jan. 2015, doi: 10.1016/j.ijproman.2014.03.008.
[26] R. Brenner and S. Wunder, "Scaled Agile Framework: Presentation and real world example," in 2015 IEEE Eighth International Conference on Software Testing, Verification and Validation Workshops (ICSTW), Apr. 2015, pp. 1–2. doi: 10.1109/ICSTW.2015.7107411.
[27] M. Kersten, "What Flows through a Software Value Stream?," IEEE Software, vol. 35, no. 4, pp. 8–11, Jul. 2018, doi: 10.1109/MS.2018.2801538.
[28] L. Sebola and L. Khoza, "The Adoption and Usage of SAFe in Financial Institutions," in 2023 International Conference on Advanced Enterprise Information System (AEIS), Dec. 2023, pp. 86–90. doi: 10.1109/AEIS61544.2023.00022.
[29] F. Moyon, K. Beckers, S. Klepper, P. Lachberger, and B. Bruegge, "Towards Continuous Security Compliance in Agile Software Development at Scale," in 2018 IEEE/ACM 4th International Workshop on Rapid Continuous Software Engineering (RCoSE), May 2018, pp. 31–34. Accessed: May 13, 2024. [Online]. Available: https://ieeexplore.ieee.org/document/8452105
[30] I. Stojanov, O. Turetken, and J. J. M. Trienekens, "A Maturity Model for Scaling Agile Development," in 2015 41st Euromicro Conference on Software Engineering and Advanced Applications, Aug. 2015, pp. 446–453. doi: 10.1109/SEAA.2015.29.
[31] "SAFe® for DevOps Practitioners: Implement robust, secure, and scaled Agile solutions with the Continuous Delivery Pipeline | Packt Publishing books | IEEE Xplore." Accessed: May 13, 2024. [Online]. Available: https://ieeexplore.ieee.org/document/10162828
[32] Ö. Uludağ, M. Kleehaus, X. Xu, and F. Matthes, "Investigating the Role of Architects in Scaling Agile Frameworks," in 2017 IEEE 21st International Enterprise Distributed Object Computing Conference (EDOC), Oct. 2017, pp. 123–132. doi: 10.1109/EDOC.2017.25.
[33] M. Gogichaty et al., "A Systemic Approach to Evaluating the Organizational Agility in Large-Scale Companies," IEEE Access, vol. 11, pp. 3307–3323, 2023, doi: 10.1109/ACCESS.2023.3234424.
[34] A. Putta, M. Paasivaara, and C. Lassenius, "SAFe transformation in a large financial corporation," Empirical Software Engineering, vol. 29, no. 1, p. 27, 2024.

[35] J. Poeppelbuss, M. Ebel, and J. Anke, “Iterative uncertainty reduction in multi-actor smart service innovation,” Electron Markets, vol. 32, no. 2, pp. 599–627, Jun. 2022, doi: 10.1007/s12525-021-00500-4.
[36] O. Turetken, I. Stojanov, and J. J. M. Trienekens, “Assessing the adoption level of scaled agile development: a maturity model for Scaled Agile Framework,” Journal of Software: Evolution and Process, vol. 29, no. 6, p. e1796, 2017, doi: 10.1002/smr.1796.
[37] Ö. Özcan-Top and F. McCaffery, “A hybrid assessment approach for medical device software development companies,” Journal of Software: Evolution and Process, vol. 30, no. 7, p. e1929, 2018, doi: 10.1002/smr.1929.
[38] E. E. Cremers and P. L. Curşeu, “Mind the (identification) gap: Foci in multiteam systems and their impact on innovative work behaviours,” Systems Research and Behavioral Science, vol. 41, no. 3, pp. 413–427, 2024, doi: 10.1002/sres.2978.
[39] M. Saarikallio and P. Tyrväinen, “Quality culture boosts agile transformation—Action research in a business-to-business software business,” Journal of Software: Evolution and Process, vol. 35, no. 1, p. e2504, 2023, doi: 10.1002/smr.2504.
[40] M. Yilmaz, E. O’Farrell, and P. Clarke, “Examining the training and education potential of the metaverse: Results from an empirical study of next generation SAFe training,” Journal of Software: Evolution and Process, vol. 35, no. 9, p. e2531, 2023, doi: 10.1002/smr.2531.
[41] D. Ståhl, “The dynamic versus the stable team: The unspoken question in large-scale agile development,” Journal of Software: Evolution and Process, vol. 35, no. 12, p. e2589, 2023, doi: 10.1002/smr.2589.
[42] H. Bomström et al., “Information needs and presentation in agile software development,” Information and Software Technology, vol. 162, p. 107265, Oct. 2023, doi: 10.1016/j.infsof.2023.107265.
[43] M. Zielske and T. Held, “Application of agile methods in traditional logistics companies and logistics startups: Results from a German Delphi Study,” Journal of Systems and Software, vol. 177, p. 110950, Jul. 2021, doi: 10.1016/j.jss.2021.110950.
[44] W. Meding, M. Staron, and O. Söder, “MeTeaM—A method for characterizing mature software metrics teams,” Journal of Systems and Software, vol. 180, p. 111006, Oct. 2021, doi: 10.1016/j.jss.2021.111006.
[45] Y. Shastri, R. Hoda, and R. Amor, “The role of the project manager in agile software development projects,” Journal of Systems and Software, vol. 173, p. 110871, Mar. 2021, doi: 10.1016/j.jss.2020.110871.
[46] A. Bombarda et al., “Guidelines for the development of a critical software under emergency,” Information and Software Technology, vol. 152, p. 107061, Dec. 2022, doi: 10.1016/j.infsof.2022.107061.
[47] G. Collins, “Appendix 1 - Agile Project Management,” in Project Management, Planning and Control (Seventh Edition), E. I. A. Lester, Ed., Butterworth-Heinemann, 2017, pp. 529–554. doi: 10.1016/B978-0-08-102020-3.15001-6.
[48] K. Biesialska, X. Franch, and V. Muntés-Mulero, “Big Data analytics in Agile software development: A systematic mapping study,” Information and Software Technology, vol. 132, p. 106448, Apr. 2021, doi: 10.1016/j.infsof.2020.106448.
[49] P. Patanakul and R. Rufo-McCarron, “Transitioning to agile software development: Lessons learned from a government-contracted program,” The Journal of High Technology Management Research, vol. 29, no. 2, pp. 181–192, Nov. 2018, doi: 10.1016/j.hitech.2018.10.002.
[50] I. Nurdiani, J. Börstler, S. Fricker, K. Petersen, and P. Chatzipetrou, “Understanding the order of agile practice introduction: Comparing agile maturity models and practitioners’ experience,” Journal of Systems and Software, vol. 156, pp. 1–20, Oct. 2019, doi: 10.1016/j.jss.2019.05.035.
[51] A. Aldave, J. M. Vara, D. Granada, and E. Marcos, “Leveraging creativity in requirements elicitation within agile software development: A systematic literature review,” Journal of Systems and Software, vol. 157, p. 110396, Nov. 2019, doi: 10.1016/j.jss.2019.110396.
[52] D. Slama, “Agile AIoT,” in The Digital Playbook: A Practitioner’s Guide to Smart, Connected Products and Solutions with AIoT, D. Slama, T. Rückert, S. Thrun, U. Homann, and H. Lasi, Eds., Cham: Springer International Publishing, 2023, pp. 293–319. doi: 10.1007/978-3-030-88221-1_23.
[53] T. Gustavsson, “Institutional Logics in Large-Scale Agile Software Development Transformations,” in Agile Processes in Software Engineering and Extreme Programming – Workshops, P. Gregory and P. Kruchten, Eds., Cham: Springer International Publishing, 2021, pp. 12–19. doi: 10.1007/978-3-030-88583-0_2.
[54] D. Itzik and G. Roy, “Does agile methodology fit all characteristics of software projects? Review and analysis,” Empir Software Eng, vol. 28, no. 4, p. 105, Jul. 2023, doi: 10.1007/s10664-023-10334-7.
[55] R. Poston and A. Calvert, “Vision 2020: The Future of Software Quality Management and Impacts on Global User Acceptance,” in HCI in Business, F. Fui-Hoon Nah and C.-H. Tan, Eds., Cham: Springer International Publishing, 2015, pp. 748–760. doi: 10.1007/978-3-319-20895-4_70.
[56] J. P. Castellanos Ardila, B. Gallina, and F. Ul Muram, “Compliance checking of software processes: A systematic literature review,” Journal of Software: Evolution and Process, vol. 34, no. 5, p. e2440, 2022, doi: 10.1002/smr.2440.
[57] J. Liker, The toyota way. Esensi, 2021.
[58] Scaled Agile Inc., “Implementation - Create a Lean-Agile Center of Excellence - Scaled Agile Framework.” 2024. [Online]. Available: https://scaledagileframework.com/lace/
[59] J. Bowring and M. Paasivaara, “Keeping the Momentum: Driving Continuous Improvement After the Large-Scale Agile Transformation,” 2021, pp. 66–82. doi: 10.1007/978-3-030-91452-3_5.
[60] Scaled Agile Inc., “Inspect and Adapt - Scaled Agile Framework.” 2024. [Online]. Available: https://scaledagileframework.com/inspect-and-adapt/