

Social Sustainability and Large-Scale Agile Software Development

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Abstract

Large Scale Agile (LSA) projects present unique challenges in maintaining a positive and sustainable work environment. This study examines the social sustainability factors that influence the LSA project. A multiple case study approach was employed, involving semi-structured interviews with software professionals working in three Swedish IT companies. Thematic analysis revealed a network of interrelated eight factors that impact social sustainability in LSA projects, including trust and communication, learning culture, self-organisation, decision-making, leadership behaviour, and psychological safety. This study emphasises the human-centred aspects that are crucial for the successful implementation of LSA projects and the enhancement of social sustainability.

Keywords: Agile, large-scale agile, software development, project management, social sustainability.

1. Introduction

The software industry is a dynamic landscape characterised by intense competition, demanding markets, and ever-evolving customer needs. Agile methods have emerged as a successful approach in this context due to their adaptability, rapid response capabilities, and focus on customer satisfaction [1], [13]. However, achieving true sustainability within agile development necessitates a holistic perspective that encompasses economic, environmental, and most importantly, social considerations [2].

Organisations are increasingly integrating sustainability practices not only to attract customers but also to make a positive societal impact. Social sustainability, in particular, prioritises the well-being of individuals and communities. This includes factors such as employee health, decent working conditions, and overall quality of life [3]. While research has explored the environmental and economic aspects of sustainable software development [4], the social dimension remains relatively understudied [5].

This gap is significant because agile methods, with their emphasis on user participation and continuous improvement, present a unique opportunity to enhance social sustainability. Our research aims to investigate the factors influencing social sustainability and their impact on LSA projects. This qualitative study will examine the influence of the social sustainability factors proposed by Missimer et al. [6, 7].

2. Research Method

This study employed a multiple case study approach [15] to investigate social sustainability factors within the LSA context. Three Swedish IT companies were selected as cases working on LSA projects. All companies implemented established LSA frameworks, such as SAFe and LeSS. It was ensured that the interviewees had relevant large-scale agile experience. Potential interviewer bias was minimised by interviewing a diverse group of people with different roles within each company.

A total of 20 semi-structured interviews were conducted, each lasting between 70 and 120 minutes. Key concepts were introduced beforehand to minimise misinterpretations. The interviews were conducted in accordance with a pre-defined set of questions designed to elicit insights into social sustainability factors as outlined by Missimer et al. [6, 7]. All interviews were recorded, transcribed verbatim, and subsequently reviewed by the participants for accuracy. The data were analysed with the help of social sustainability factors proposed by Missimer et al. [6, 7]. The framework provided a structured foundation for the exploration of social sustainability aspects in the context of LSA projects, including factors such as employee well-being and team dynamics.

Table 1. Social sustainability factors influencing LSA projects.

Factors	Link to LSA context	Excerpt from interviews with software professionals
Trust and respectful relationships	Trust and open communication are crucial in LSA due to distributed teams and complex projects. A supportive environment fosters collaboration and reduces friction.	<i>"When I encounter an issue, I never feel isolated. If I ever need assistance, I simply reach out, and there is always a helping hand. We do a lot of funny things together, and conflicts are virtually non-existent. It is a truly exceptional team, and we genuinely support and uplift each other. I believe our team friendliness is obvious to all". "Trust is a work in progress for us at the moment because there is limited visibility into what each part of the team is currently working on".</i>
Effective communication	Clear and timely communication is essential in LSA to avoid misunderstandings, delays, and rework.	<i>"It's often challenging to discern what information and support people require, and this can lead to misunderstandings. Sometimes, people express not knowing about certain aspects, and that is understandable. However, upon reflection, it becomes evident that the issue lies in inadequate communication". "Within our team, we have individuals from various backgrounds and cultures. There are hierarchy issues. Hierarchical issues further complicate matters, as some team members refrain from speaking up, assuming that those higher up the hierarchy should take the lead. This tendency to delay to higher-ups can present challenges regarding nurturing active participation during meetings".</i>
Capacity for learning	A culture of continuous learning is vital in LSA to adapt to changing technologies and customer needs.	<i>"Great employees are characterized by intrinsic curiosity and eagerness to embrace new learning experiences and ask questions. They consistently strive to ensure customer satisfaction, going above and beyond to assist both customers and colleagues, while also actively engaging in knowledge-sharing".</i>
Capacity for self-organization	Self-organizing teams are key to LSA success. They can quickly adapt to changing priorities and manage their workload effectively.	<i>"Our team operates with a proactive ethos; we do not wait for things to land on our desks. If you're actively seeking knowledge and growth, this environment is exceptionally conducive".</i>
Decision-making	Empowering teams to make decisions closer to the work improves agility and responsiveness in LSA.	<i>"I believe that decision-making should be decentralized and pushed further down within the organization currently, only a select few individuals manage all economic matters, but a more distributed approach would be preferable".</i>
Collaboration and cooperation	Effective collaboration across teams is essential in LSA to ensure project success. Improved planning helps manage dependencies and communication between teams.	<i>"Navigating our work can be quite challenging due to our large organization comprising 40 teams, which naturally results in dependencies on other teams. We often find ourselves in situations where one team must complete their tasks before another can proceed. In the past, communication within the organization was lacking in structure, and planning was not used. While we have taken steps in implementing planning processes, effective communication remains a lingering issue. When things go wrong, human nature tends to manifest, with individuals pointing fingers at one another".</i>
Leadership behavior and stress reduction	Strong leadership is crucial in LSA to manage growth, mentor new team members, and mitigate stress caused by rapid change.	<i>"The most prominent challenge we face is the rapid growth of the company. This places a burden on our senior consultants, who must simultaneously train new team members and fulfill their own job responsibilities. This scenario can be quite stressful and exert pressure on these individuals. Managing the onboarding process is a major concern that demands our ongoing attention, all while preserving a positive team spirit, even as the company continues to grow".</i>
Psychological safety	Psychological safety allows team members to share ideas and concerns freely, leading to better decision-making in LSA projects.	<i>"I have not felt at least that people are afraid to speak their minds because people do speak their minds if they are unhappy with something".</i>

3. Results and Discussion

Our analysis of interviews with software professionals working on LSA projects (with

team sizes of 3–10 and experience levels ranging from 1 to 25 years) revealed the existence of a complex network of interrelated social sustainability factors (see Table 1 for details).

The findings indicated that trust and clear communication were foundational elements for collaboration and shared understanding. A culture of continuous learning and knowledge sharing was seen as crucial for individual and team growth. Self-organized teams require internal drive and a supportive environment. Effective decision-making necessitates collaboration and user input, while strong leadership plays a critical role in managing growth, mentoring new team members, and mitigating stress. Finally, psychological safety, which can be defined as a sense of comfort among team members to share ideas and concerns freely, is essential for healthy communication and innovation.

These findings align with previous research that has highlighted the importance of psychological safety in promoting social sustainability [16] [18]. It promotes open communication, continuous learning, and effective feedback, which in turn leads to team cohesion, shared understanding of goals, and ultimately, knowledge sharing and team effectiveness [9] [10] [12] [14] [18]. Conversely, its absence can correlate with social problems [9] [14]. Leaders play a critical role in fostering psychological safety by showing appreciation and encouraging learning from mistakes [16].

Trust is another crucial element for effective collaboration in LSA teams. Self-organisation, can be enhanced by trust and communication, empowering teams. Effective communication is central to learning and collaboration, enabling knowledge sharing and fostering innovative solutions. While the agile approach promotes individual meaning-making, social sustainability can be challenged by difficulties in visualising the bigger picture in large projects. The utilisation of shared mental models can address this challenge and contribute to a reduction in non-technical debt, as evidenced by the findings of studies [9] [10] [14]. It is evident that the human-centred elements are of paramount importance for the successful implementation of LSA projects.

Psychological safety, trust, and self-organisation play a pivotal role in fostering social sustainability within LSA teams. Adopting the definition proposed by Missimer et al. [6] [7] offers a novel perspective on organisations as social systems, which may lead to the development of new frameworks. Organisations can prioritise employee well-being, leadership behaviour, communication, and socially responsible initiatives to enhance governance standards and promote social sustainability. The integration of social sustainability principles into project management, as recommended by Gareis [11], can provide valuable insights into decision-making processes.

Social sustainability efforts can promote better governance practices, improve team morale, stakeholder engagement, and ultimately project success. Prioritising social sustainability alongside environmental sustainability strengthens an organisation's overall sustainability performance [5] [8].

4. Conclusion and Future Research Directions

This study investigated the social sustainability factors influencing LSA projects. Our study highlighted a network of interconnected factors, including trust, communication, learning, self-organisation, decision-making, leadership, and psychological safety. These factors contribute to a positive and healthy work environment, which ultimately impacts project success. Our findings demonstrate that paying attention to these factors helps LSA teams to reduce stress, burnout and conflict, which ultimately leads to higher team effectiveness, project success and social sustainability.

It should be noted that the findings may not be universally applicable. However, the analytical generalisation approach was employed, whereby similarities across cases were sought, rather than statistical significance. Nevertheless, the observed factors may be relevant to similar complex, technically demanding LSA projects with multiple teams, due to the shared characteristics of the cases.

Future research should explore effective interventions using systems thinking to address the complex interplay between social and sustainability issues. This could involve investigating how agile structures, psychological safety, and organisational culture can be

leveraged to promote social sustainability within the LSA context. Additionally, in-depth case studies examining the link between specific LSA frameworks, frugal innovation, and social sustainability offer another promising avenue for exploration. The investigation of these areas will significantly improve our understanding of social sustainability and ultimately contribute to more sustainable and socially responsible business practices.

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