Views on Agile Leadership for Software Teams

A Case Study with Leaders and Non-Leaders

Narallynne Araújo
Federal University of Campina Grande
Campina Grande, Brazil
narallynne@copin.ufcg.edu.br

Tiago Massoni
Federal University of Campina Grande
Campina Grande, Brazil
massoni@computacao.ufcg.edu.br

Lucas Gren
Chalmers and the University of Gothenburg
Gothenburg, Sweden
lucas.gren@cse.gu.se

ABSTRACT

Recent research suggests that agile leadership is regarded as shared, transformational, and dynamic, in the view of technical leaders themselves. Also, it promotes collaboration and a strong sense of belonging, requiring a balance in integrating different organizational cultures. On the other hand, previous research overlooks the perspective of developers who are non-leaders. We conducted a case study involving leaders and non-leaders in two software development teams. The way leaders share leadership activities are similar in terms of technical experience and team tenure but differ in terms of team size, and non-leaders' aptitude to take on leadership activities. Also, non-leaders' views on leadership differed from those of leaders; non-leaders considered the leadership they received as individual and hierarchical, in contrast to the leaders' views, who perceived agile leadership as a shared team attribute. These different points of view provide insights into how the development process can be affected, especially when assigning roles and responsibilities between leaders and non-leaders to achieve agile leadership benefits.

KEYWORDS

leadership view; agile leadership; non-leaders; leaders, software development.

1 INTRODUCTION

With the emergence of the Agile Manifesto in the early 2000s and the continuous increase in complexity and dynamism in the software development landscape, the need for more adaptable and flexible leadership approaches became evident [8]. However, agile leadership is not limited to the application of agile project management methods but represents a broader approach that permeates different organizational cultures and software team structures [11, 16]. This form of leadership values adaptability, team autonomy, and decentralized decision-making, favoring the distribution of responsibilities and promoting self-regulation. In essence, agile leadership emerged as a response to the growing demands of the complex software development sector to make teams more resilient and effective in the search for innovative, and high-quality solutions [39].

With the scarcity of empirical studies that adequately understand and define agile leadership in the context of Software Engineering (SE) [26], significant uncertainties persist about its practical application and impact on the software development process. Furthermore, *most of the existing studies on leadership in the context of SE tend to focus exclusively on the context of leaders* [2, 12, 17, 23, 27, 40], neglecting the context of those who do not call themselves leaders, but who play key roles in self-organized or self-managed teams where leadership is distributed [17]. Although a few studies have addressed aspects of agile leadership, there is no clarity on the perspective of non-leaders within these teams [26].

Given this problem, *we carried out a qualitative case study with two software teams*, aiming to assess how agile leadership, with its principles of sharing responsibilities and collaborative decision-making, is seen mainly by those who do not consider themselves leaders, and whether there are significant differences in the way leaders share this leadership among team members who are not leaders. This prompted the following research questions:

RQ1: Are there differences in how leadership is shared by leaders between non-leader team members?

RQ2: Are there differences in the leadership view between leaders and non-leaders?

For us, *non-leaders* are those individuals or members of software development teams who do not play self-appointed leadership roles in that context, i.e., they do not play a leadership role but eventually take on leadership activities, such as decision-making (whether at an operational or strategic level), leading meetings, mentoring less experienced colleagues, among others [34]. In other words, they do not occupy designated positions of leadership or authority, and their influence on decision-making and group guidance can be limited. This raises the question of how agile teams actually function in terms of leadership and whether expectations regarding agile leadership are aligned with the reality of the daily practices of software development teams.

A previous study [17] identified that, for leaders, *"Agile leadership is dynamically shared among team members, seen as a team attribute"*. Our results suggest that leadership is also dynamically shared, *but situationally*, based on *non-leaders' experience, time on the team, and team size*. For leaders, the same, but instead of team size, the *non-leader's aptitude* for leadership activities (skills) also counts. Similarly, individuals in non-leadership roles perceive leadership as linked to an individual, unlike leaders who consider agile leadership as a collective property, or a team attribute, like previous work [17].

Since different interpretations of agile leadership can influence team dynamics, communication, decision-making, and motivation, ultimately affecting the software development process and product quality [35], this research aims to contribute insights into the role of agile leadership in software development, which can, in turn, help improve software processes and outcomes.

2 RELATED WORK

In its general concept, leadership encompasses various theories and situations of its application that vary according to the different areas and, most of all, the context of the teams where it is used [24, 39]. In SE, introducing agile principles in teams has reshaped the leadership landscape, prioritizing individuals and interactions, working software, collaboration with the customer, and responsiveness to change, requiring reform in leadership approaches to accommodate these values [8]. While guidelines such as the Scrum Guide Body of Knowledge [33] and the Agile Practice Guide with Scrum [32] offer practical advice for agile projects, they still provide limited guidance on effective agile leadership in software development teams [26, 39].

Modi's 2020 systematic review [26] divided three categories of studies: a) studies on leadership theories, b) related theories and models covering leadership, and c) leadership styles. The leadership theories used include the Full Range Leadership Theory, a Leadership Taxonomy, Complex Leadership Theory, and Role Theory [39]. The leadership styles examined include adaptive, shared, transformational, ad-hoc, mentor, servant, situational, expert, and super leadership [39]. The authors conclude that, despite the growth in research into agile leadership since 2005, it remains an emerging field that needs more empirical studies[26]. For Weichbrodt et. al. [39], the systematic review must show a consensus on agile leadership in the field. However, it does suggest that leadership is moving away from being hierarchical and bureaucratic, emphasizing the need for leadership to adapt as agile teams evolve and mature.

This leads to another perspective of agile leadership, the self-management and self-organization, where agile teams take control of their processes and decisions, reducing the need for a centralized hierarchical leader [27]. Agile leadership can also be transformational, stimulating and inspiring followers to achieve exceptional results and develop their leadership capabilities within the development process [2, 5].

In the study by Gren and Ralph [17], they outline what an effective agile leadership model would look like based on the perspectives of software development team leaders. Effective agile leadership, as observed by the leaders in the study, is characterized by the dynamic sharing of leadership responsibilities among team members, allowing them to take the initiative and assume responsibilities [17]. In addition, this leadership must allow the team to unite, generating a strong sense of belonging and providing the ability to balance and adapt to competing organizational cultures, for example, when moving from a waterfall culture to an agile culture [17]. Unlike traditional approaches, agile leadership values autonomy, open communication, and the ability to respond to rapid change. In this way, the agile leader acts as a facilitator, encouraging team self-organization and removing obstacles that might impede progress [20].

Weichbrodt et al. [39] report a study on the nature of different aspects of leadership in agile teams using an established model of leadership that distinguishes between transactional and transformational styles, both from direct supervisors (hierarchical leadership) and from the team itself (shared leadership). The results show that agility is indeed related to the transformational style but that the transactional style also plays an important role, especially in shared leadership. Furthermore, even in agile software development, the leadership of direct supervisors still plays an important role. The authors propose that as software development becomes more agile, the transactional aspects of leadership may migrate from supervisor-employee (hierarchical) leadership to the agile team (shared). In contrast, transformational leadership is important for both the team and the supervisors.

2.1 Theories Supporting Agile Leadership

2.1.1 Dynamic Team Leadership Theory. The Dynamic Team Leadership Theory (DTLT), proposed by Kozlowski et al. [22], suggests that leaders can get specific skills throughout different phases of team development, which provides a basis for developmental transitions [19, 22]. Kozlowski et al. argues that the cyclical nature of team tasks provides opportunities for leaders to explicitly stimulate individual and collective regulation processes to develop specific team capabilities. It is clear that leadership plays a crucial role in the development of dynamic capabilities [19, 22]. So, DLDT involves reduced control and guidance, emphasizing instead the leader's developmental and instructional skills applied gradually over time [17, 22]. In addition, for the same author, effective team members share leadership dynamically, distributing leadership work among team members in constant flux. [17].

Huang [19] states that leaders should facilitate feedback on the process of dynamic leadership, helping team members identify deficiencies and areas that need further development in future engagements. Based on this theoretical perspective, it is argued that dynamic capabilities in projects can only be developed when led by strong individuals who can withstand change [19].

2.1.2 Situational Leadership Theory. Situational Leadership Theory (SLT), developed by Hersey and Blanchard in the 70's [18], emphasizes adapting leadership styles to team members' readiness and maturity levels. Leadership behavior and team members' readiness are critical factors in determining the most suitable leadership style for a given situation [18].

The leadership behavior has four main styles, each associated with different levels of direction and support provided by the leader [18]:

- Telling: The leader provides clear and specific instructions on what needs to be done without giving much scope for the leader to make decisions;
- Selling: The leader continues to provide direction but also seeks the involvement of the leader and explains the decisions made;
- Participating: The leader offers emotional support and listens to the ideas and suggestions of the team members, allowing them to participate in decision-making actively;
- Delegating: The leader passes responsibility almost entirely to the team members, allowing them to make decisions and act more independently.

Team member readiness refers to their ability and willingness to perform a specific task. It is assessed based on two main situational factors:

- Competence: The level of skill, knowledge, and experience of the leader in the task at hand;

- Commitment: The leader's motivation and confidence to perform the task successfully.

The combination of leadership behavior and the level of readiness of non-leaders means that the leader determines his or her appropriate behavior for the team's situation at a given time [18]. For example, if a non-leader is highly competent and motivated to carry out a specific task, the leader may adopt a more delegation-oriented style. On the other hand, if a team member is inexperienced and insecure, the leader may need to be more directive and provide clear instructions [15].

Varanasi [37] investigated how situational leadership is implemented in Scrum-based software development, finding that teams often adopt a mix of directive and collaborative leadership styles based on the situation [37].

2.1.3 Transformational Leadership Theory. Transformational Leadership Theory, as described by Burns [11] and Bass and Riggio [5], focuses on fulfilling higher needs and inspiring followers to achieve innovative solutions and a better work environment. Four key dimensions, the "4 I's", characterize transformational leadership, they are [2, 5]:

- Idealized influence: when the leader acts as a role model, and his followers respect, admire, and trust her, developing a shared viewpoint and improving relationships among team members;
- Individualized consideration: when the leader gives special attention to his followers individually, enabling them to create a learning climate;
- Intellectual stimulation: when the leader makes his followers analyze the problems in new ways, from different angles, encouraging the sharing of knowledge within the company to generate more innovative ideas and solutions;
- Inspirational motivation: when the leader motivates his followers by setting meaningful goals for them and inspiring them to achieve them.

Studies by Weichbrodt et al. [39], Yang, Huff, and Strode [40], Li et al. [23], Araújo et.al. [2] and Ghafourian et al. [14] examine how transformational leadership styles are related to agility, project success, and workforce retention in the software development context.

These same works refer to the theory of transformational leadership as a leadership style, which, together with the transactional and laissez-faire styles, comprises the Full-range Leadership Theory[5, 21]. Transactional and laissez-faire leadership have those dimensions [2, 5]:

- Contingent reward: when the leader recognizes what needs to be done, support in exchange for the necessary effort;
- Management by exception (active and passive): hen the leader gets organized to know if something went wrong, remaining alert for breaches of the rules (active); or when the leader takes no action unless some problem arises (passive);
- Laissez-faire: When the leader (laissez-faire) withdraws from her/his role and offers little in terms of direction or support.

In practical software engineering terms, transformational leadership is intertwined with the practices and characteristics of agile leaders, as they provide continuous guidance and support to their subordinates, creating a collaborative environment and allowing them to make decisions, a characteristic of self-managing teams [30, 39]. In this case, the leader acts as a facilitator and is not seen as a central figure who makes all the decisions [17, 26].

3 METHOD

The ABC framework [36] guides research strategies based on three aspects: generalizability of actors (A), precise control of behavior (B), and realism of context (C). Our study falls into aspect C, representing a field study, as it aims to understand leadership phenomena from non-leaders' perspectives in their natural environment. This approach maximizes the realism of the context while minimizing generalizability, aligning with the case study methodology in software engineering [36].

We also follow the SE research guide proposed by [31]. This guide outlines the essential steps to conduct a case study in the context of SE [31]. It is important to note that the objective of this qualitative case study was not to generalize the findings in statistically significant samples to the population. Instead, it aligned with the exploratory nature of the research in accordance with the interpretivist paradigm [4]. This type of case study is designed to facilitate a deep understanding of the phenomenon under investigation and can serve as a basis for formulating theories and hypotheses applicable to similar contexts [36]. We adopted a constructivist paradigm, aligned with an interpretivist perspective [4]. This perspective allowed observations and interactions with software developers, capturing their unique viewpoints, making it suitable for SE research [31].
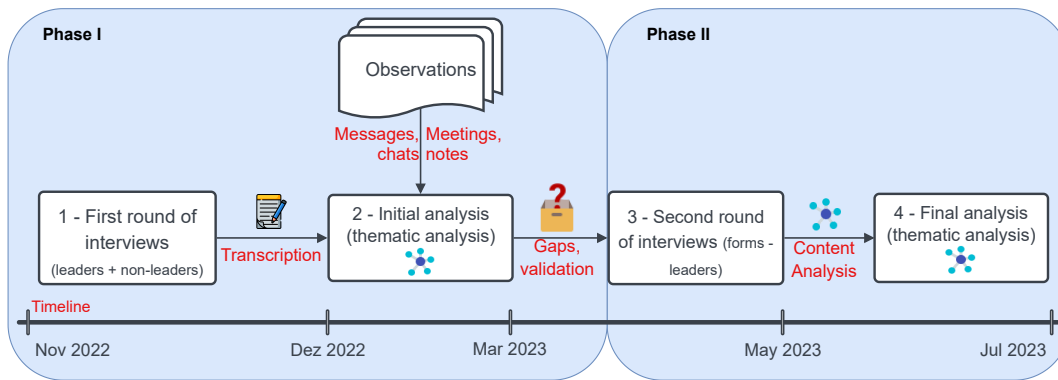
3.1 Participants

Our research mainly focused on software developers who do not consider themselves leaders. However, we also investigated self-appointed team leaders to compare them with non-leaders' views and previous research [17]. Our research focused on two software development teams, each affiliated with different companies and projects covering various domains. This approach is based on analyzing embedded case studies [31, 41], in which the main focus is to investigate how these non-leaders and leaders perceive agile and effective leadership from their unique points of view and how it is distributed from leaders to non-leaders.

The first team (*Team A*) is affiliated with a project established through a partnership between a multinational technology company and an university, both in Brazil. Although the company's leadership chose not to participate in the study, the researcher established an observation and research relationship with the university team with seven graduate and undergraduate developers, including a self-appointed leader. There was no direct interaction between the researcher and the company, ensuring that the research activities did not interfere with the team's work.

The second team (*Team B*) is part of a project affiliated with a software development company in Brazil that specializes in digital platforms for retail. This context allows an in-depth exploration of how software developers in different organizational environments perceive and experience agile leadership. All four team members are graduate professionals, including a self-appointed leader.

Table 1: Participant's information

ID/Team	Role	Time in the team (years)	Experience in software projects (years)	Education level	Previous experience with Agile?
P1/A	Developer	2 - 3	2 - 4	Graduate	No
P2/A	Developer	2 - 3	2 - 4	Graduate	Yes
P3/A	Developer	0 - 1	0 - 2	Undergraduate	No
P4/A	Developer	1 - 2	1 - 3	Undergraduate	Yes
P5/A	Developer	1 - 2	1 - 3	Undergraduate	Yes
P6/A	Developer	1 - 2	1 - 3	Graduate	Yes
P7/A	Leader	2 - 3	10 - 12	Graduate	Yes
P8/B	Q.A. specialist	2 - 3	8 - 10	Graduate	Yes
P9/B	Developer	0 - 1	1 - 3	Graduate	Yes
P10/B	Developer	2 - 3	4 - 6	Graduate	Yes
P11/B	Manager	2 - 3	25 +	Graduate	Yes

Figure 1: Data collection and analysis

Table 1 shows more information about the participants, represented as P#/team, where "#" identifies the participant's number.

3.2 Data Collection and Analysis

Data collection and analysis occurred between November 2022 and July 2023, following a two-phase process detailed in Figure 1. Another researcher participated in helping collect and analyze the data to reduce the principal researcher's bias. In Phase I, we conducted a first round of semi-structured interviews with non-leaders and leaders. These interviews, based on Gren and Ralph's study [17], aimed to understand participants' viewpoints on effective agile leadership in software development teams. Observations of team activities during a sprint were also conducted in parallel, capturing leadership dynamics as they naturally unfolded within the teams. The observations provided valuable insights and reinforced the consistency of the interview data.

For interviews, we used MaxQDA[1] and performed the thematic analysis following the steps recommended by Braun and Clarke [10]. This process involved:

(1) Read each transcript;
(2) Highlight all statements broadly related to the concept under investigation;

(3) Sort the highlighted statements into categories;
(4) Name each category;
(5) For each category, reread all the statements together;
(6) Reassess the cohesion and the category name.

For the observations, we followed a script adapted from Batista [7] in the two teams for 15 (fifteen) days, in meetings and chats (when authorized). From these scripts, we developed documents for each observed meeting, highlighting points related to team leadership and differences in leadership dynamics. These documents helped identify interesting observations linked to the categories analyzed in the interviews.

In Phase II, we analyzed the data obtained in the first round of interviews and observations that helped formulate the questionnaires (structured interviews). These questionnaires were sent to the leaders of the two teams to validate and confirm the results of the first phase. We only contacted the leaders to confirm the leadership aspects identified by the non-leaders, as we believe they are more aware of their leadership roles. Each form differed for each leader, as the teams' processes differed. The leaders' responses were subjected to content analysis, which helped refine the categories identified earlier in the thematic analysis. The categories were iteratively audited for consistency, and the analysis was related to existing theories in the literature, concluding the data analysis process.

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[1]https://www.maxqda.com/

It is not possible to say that there was data saturation. Unlike other exploratory studies, those using case studies usually have a defined number of interviewees: in our case, the sample was predefined, giving us a fixed number of 11 (eleven) participants. However, we observed a degree of information saturation, especially in the construct about different leadership views between previously studied leaders and non-leaders.

Finally, the results found on the leadership views of non-leaders were compared with those of the leaders studied and with the results found in previous research [17], who also verified leadership from the viewpoint of leaders. Supplementary material with interview and observation guides, documents, images, and analysis tables are in the Available Artifacts [3] (Section 7).

4 FINDINGS

The findings of the case study suggest that there are differences (but also some similarities) in the way leaders distribute leadership among non-leaders (RQ1), where the perception of leadership differs between them (RQ2). Figure 2 summarize our findings.
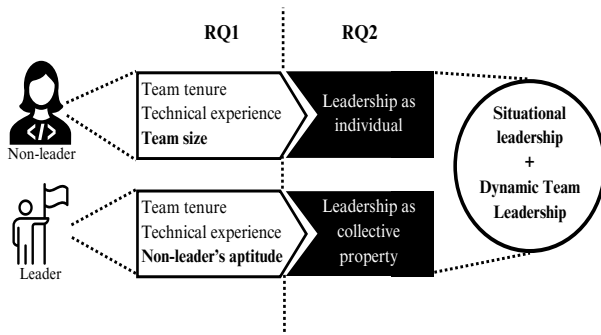

Figure 2: Non-Leaders' and Leaders' Perspectives on Leadership.

4.1 Non-leaders' Perspective on Leadership and How it is Shared

In the teams studied, the interviews and observations suggest that their leader shares some leadership activities eventually, *based on their team tenure and technical experience, and also based on team size*; when the team was smaller, leadership distribution was promoted. Furthermore, because they recognize the leader's figure as being linked to a named person in the team, their leadership view ends up being focused on this individual figure, who shares leadership in a situational way based on the individual maturity of each one.

4.1.1 Team Tenure, Technical Experience and **Team Size**. P9, who has only been on the team for a short time, says that his tenure on the team is fundamental for the leader to share some of his responsibilities: *"(...) I don't think (the leader) would give me a role, (...) Because there are people on the team who have been there longer than I am and can deal with it much better than I can." - P9/B*. P6 says that, in the team of graduates and undergraduates, team tenure is a determining factor for the leader to share leadership activities, where she tends to assign responsibilities according to this tenure,

where graduates (because they work more hours than undergraduates) receive more responsibilities than them: *"There is a difference about part-time (undergraduates) because she (the leader) generally prefers to assign to full-time (graduates) due to availability. So those of us who are full-time have a better view of what's going on" - P6/A*.

Other interviewees highlight the aspect of technical experience for the leader to share leadership responsibilities: *"Especially when there were problems in the database, as I had experience in this, I was left to decide the pairs (of developers in pair programming), so she (the leader) put me on those stories.' ' - P5/A*. Another example: *"Only at times did some decisions perhaps carry much weight, taking into account the roles within the team (...) such as someone being responsible for a huge refactoring and the person still being an undergraduate and not having as much (technical) experience in this." - P1/A*.

During Team A's internal synchronization meetings and design sessions, we observed a non-leader (P2) with more technical experience and longer tenure substitutes for the leader in his absence. At this specific meeting, she passed on all the information from the design session to the leader and helped her distribute the activities to the rest of the team. This aligns with what was found in the interviews, corroborating that team tenure and experience are relevant factors in deciding who takes on leadership activities based on individual maturity.

In addition, some non-leaders also mentioned that team size influences the sense of belonging related to effective leadership [17]. According to the leaders studied by Gren and Ralph [17], they believe that agile leadership is effective when there is a strong sense of belonging and a common purpose within the team. Two of the non-leaders of Team B also emphasized that, as the team is small, they have a sense of belonging and friendship, which, in their opinion, facilitates collaboration: *" (...) my team has reached a level where we are so close that when things go wrong, let's put it that way, we get together and solve the problem (...). So our coexistence is very harmonious (...). I feel part of where I am, and I feel good about it" - P8/B; "I think it's at this time (under pressure) that we see constant conversation and concern for everyone. I think the fact that we're a small team also contributes a lot because we stick together" - P9/B*. In other words, to the extent that they come together to solve a problem, this clearly expresses characteristics of self-organized teams, which allows the exercise of shared leadership [17, 27].

A non-leader (P8/B) reported an impediment during the Team B (smaller team) retrospective meeting we observed, and the leader asked her if she knew how to solve the problem. She told her the idea, and the leader said she trusted her. In this sense, it was possible to see that the leader acts in a more guiding way and places trust in the non-leader. Furthermore, in the same team, in a retrospective meeting, the feeling of hierarchy is minimal among them, and it is possible to perceive a stronger sense of unity and cooperation among the Team B's members, including the leader and non-leaders. In Team A (the largest team), on the other hand, it was observed that in two meetings (design session and daily), the leader was not present, and one of the non-leaders took on the role of team leader. It suggests an aspect of laissez-faire leadership on the part of the leader, where leadership is almost absent [2, 5]. P2/A reported this absence: *"Tuesdays and Thursdays are two days that she (the leader) doesn't really enter (the team's communication channels). (...) There*

are five days in the week, and that's almost half the time we don't have someone really there on a day-to-day basis" - P2/A.

4.1.2   Leadership view as Individual Function by Non-Leaders. In the teams studied, some non-leaders (P1/A, P3/A, P4/A, P5/A, and P9/B) see leadership as a function linked to an individual, two (P6/A and P10/B) sees leadership as a function but also as a team property, and other two (P2/A, P8/B) consider leadership as a team property. In other words, most have their vision linked to the role of the leader, where, even in self-organized and self-managed agile teams, someone is exercising leadership [17].

P1/A, P5/A, and P9/B, for example, explicitly said that they see leadership as a function attributed to an individual: *"I see it as attributed to a person, from the beginning we knew that (the leader) had this function of manager (...)" - P1/A*; P5 and P9 still perceive that, although some people have aspects of leadership, the role of an individual leader is necessary: *"I see it more as a function assigned to one person. So, I believe that various people in our team have aspects and points of leadership, but I think there has to be a leader." - P5/A*; *"I would say that (leadership) belongs to one person. However, I don't think there's anything to stop someone from being a sub-leader, so to speak, in particular, individual processes. But I think the leader, in itself, is individual." - P9/B.*

P6/A and P10/B, non-leaders with a team tenure between one and three years, recognize leadership as a function and also as collective property. In contrast, non-leaders exercise leadership functions (decision-making) at a more operational level: *"We also make some minor decisions, for example, alternative ways of implementing what is being asked (...) when we see that there is a better way of doing it and we always have that freedom to decide. But for me, the real leader is (name of leader)." - P6/A*; *"(...) Everyone has a voice to put forward their point of view. However, in the end, it's the leader who decides. But everyone is heard, and everyone's opinion is considered." - P10/B.*

P2 and P8, on the other hand, are considered to be the non-leaders with the most technical experience and team tenure. In their view, leadership is entirely a collective property of the team: *"I particularly think it's a property of the team because I believe that you don't necessarily have to be in a managerial position to take some leadership directive. (...) I believe that it wouldn't necessarily all have to be associated with a managerial figure (...)" - P2/A*; *"I'd say it's more of a team property within agile. Within Agile, you sometimes have to take on roles that require leadership characteristics. So, for example, in the absence of the leader, I sometimes play the midfield leader role. (...) Sometimes you need to put your leadership hat on to get the business moving." - P8/B.*

However, when asked who is in charge of the team, only P8 (Team B) recognizes that it is the team that is in charge: *"The team. (...) We know that there's a role for our leader, and we respect that hierarchy, (...) but we need to have that skill and leadership game as well. (...)" - P8/B*; Meanwhile, P2 recognizes the role of his leader: *"In charge of the team, so, speaking in an efficient way (leader's name)" - P2/A.*

During a Team A grooming meeting, when P2/A was substituting for the leader in his absence, she suggested changing the points in an activity assigned to pair programming between a non-leader with shorter tenure and another with longer tenure. As for Team B, in the refinement meeting, we observed P8/B decided on how

to carry out a test task since she is a quality specialist, where she instructed the non-leader on how to proceed with the task. The team leader remained uninterrupted. The evidence suggests that because these two non-leaders are considered to be the most mature in the team, they are able to maintain a leadership experience that is similar to that of the appointed leader.

According to the thematic analysis results, experience and team tenure can be seen as attributes of mature teams, as they may be better equipped to understand and perform their roles effectively [29]. The size of the team can also influence the degree of cohesion, in which team members are motivated to be part of the team [29]. Thus, about pre-existing leadership theories, the SLT stands out in this sense, as the evidence shows that the non-leaders studied perceive a situational style in their leaders, depending on their level of maturity, in this case, individual, so that they can assume any leadership positions in their teams.

4.2   Leaders' Perspective on Leadership and How it is Shared

Among the two formal leaders studied, both also stated that they share some leadership activities based on experience and team tenure too, *but also according to the non-leader's aptitude to carry out these types of activities*. So, they see leadership as a collective property of the team because they can eventually distribute leadership activities among non-leaders.

*4.2.1   Team Tenure, Technical Experience and **Non-leaders' Aptitude**.* Team A's leader says that, regardless of their education, members need to have a sense of responsibility and commitment in order to take on leadership activities: *"...there are people in the team who, regardless of whether they are undergraduates or graduates, already have that degree of taking on a story. (...) Some people in the team don't yet have this sense of responsibility or commitment." - P7/A.* Another example: *"More than the developer's experience in the project or previous projects, what was taken into account was the developer's interest in taking on this role in the execution of the project." - P7/A.*

For her, experience and tenure also influence the assignment of leadership activities. However, it is inseparable from the non-leader aptitude to take on such responsibilities: *"...Even one of the project members who had already left (had been on the team for longer) took on the responsibility to take on the role of leader while I was away (...), to try to make life easier for the other members in some development scenarios (...). I asked if she would feel comfortable taking on these responsibilities when I wasn't there, and she said yes. (...) When she left, I talked to another member (also experienced and with more team tenure) to see if she would like to take on this responsibility and (...) I'm seeing what she's doing, taking the lead (...)" - P7/A.*

Team B's leader also emphasizes that it is necessary to "possess leadership skills" so that the non-leader can take on this role with mastery: *"I think leadership is a question of skill and maturity, right? You learn about it, you study about it, but if you don't have the skills (...), you can't lead. (...) So, I think that agile leadership is made up of your motivation and your technical leadership, right? (...)." - P11/B.*

Experience also counts for this leader, and in the same way as Team A's leader, aptitude is inseparable: *"We have a technical leader... She knows the most about the product. She's passionate. She*

even has a nickname, right? The person from (project name). So she's the person who's wear the product's shirt (...). She knows the product, she's enthusiastic, she's motivated. Yes, and she has the technical ability with any of the applications, any of the technologies that are in the product (...)." - P11/B

It was observed during the meetings, and in some of Team A's chat conversations, that one of the more experienced non-leaders, possessing longer tenure, exhibited leadership-related competencies, such as active communication, the ability to solve problems and answer for the team in the absence of the leader (as was observed in the design session and daily meeting), as well as getting on well with all the other non-leader colleagues, generating a feeling of security and companionship.

Similarly, Team B has more experienced non-leaders, i.e., those with greater maturity. This suggests that the more mature the team, the more their members (non-leaders) can take on leadership activities in different aspects of the project [35].

4.2.2 Leadership view as Collective Team Property by Leaders. For both leaders studied, leadership is seen as a collective property of the team, as identified in previous work [17, 35]. In other words, more than a function, the more experienced members in the case study, with leadership aptitudes, can dynamically exercise the leader's activities to guide the team toward its goals [17].

Team A's leader explicitly says that she sees leadership as ownership, contributing to a collaborative environment: *"I see it as ownership. In fact, most of what I do is discuss, together we devise a solution. So (...) we discuss and build the solution. Even from the point of view of taking responsibility, I also encourage the staff to do this (...)." - P7/A.* When asked in the second round of interviews about how she sees his leadership, this same leader said that she prefers to keep the process decentralized: *"I see it as a way of keeping more than one person aware of the overall vision of the project and aware at a deeper level of detail about what everyone (or most everyone) was working on." - P7/A.* This leads to the characteristic of a dynamic team leader since she exercises her leadership based on a collective idea within a relationship of help, partnership, and trust [13].

Team B's leader, on the other hand, recognizes the role of one of the non-leaders as a technical leader and developer because she has in-depth knowledge of the product they are developing: *"It's not just one position, right? (the leadership). There's a developer who is also, let's say, an unnamed technical leader. She is the person who knows the most about the product." - P11/B.* When asked in the second round of interviews what her leadership looks like, P11/B recognized her leadership as situational, but that the objectives are not linked to the role of the leader: *"I exercise a situational leadership, with elements of transformational leadership, but taking care that the idealization of the objectives remains in the cause to be achieved and not linked to the figure of the leader." - P11/B.* This suggests that, despite considering leadership as situational, the idea of dynamically sharing leadership may remain so they would not be mutually exclusive.

In an internal Team A's synchronization meeting, dynamic leadership could be seen when, at one point, the leader asked the non-leader (who had taken her place in a previous meeting) for information on task allocation decisions made in previous meetings, corroborating the idea of collaboration present in the DTLT. In a Team B refinement meeting, the leader informed the Producer

Owner about more strategic decisions (related to the business plan) and allowed the non-leader (QA specialist) to define backlog activities according to her experience at a more operational level.

In the interview, she also reported an idea of distributing leadership situationally (in levels): *"The sharing of leadership, in my view, should be done in layers of leadership (strategic, tactical, and operational). (...) Operational - technical level, (...) can be delegated and only needs monitoring. At the tactical level, leadership is shared, but decisions require consultation and approval. The strategic ones cannot and should not be delegated because they are actions taken in another company sphere with Product Owner and Business." - P11/B.*

Thus, for the leaders studied, the perceived type was the same as that found in previous work: leadership in which activities are distributed dynamically among team members (DTLT), who constantly adjust their shared leadership work to the changes that may arise [17]. However, it can be seen that the SLT is not exclusive, which leads one to believe that this dynamically shared leadership is done according to the individual maturity of the non-leaders of the teams.

Summarizing the answer to the research questions:

RQ1: Are there differences in how leadership is shared by leaders between non-leader team members?

Yes, there are notable differences in perceptions regarding the size of the team and the aptitude of non-leaders to carry out these activities. In other words, while non-leaders perceive that the distribution of leadership activities varies with the size of the team, leaders highlight non-leaders aptitude as a determining factor for this distribution. However, there are also some similarities in how non-leaders and leaders perceive the distribution of leadership activities based on the length of time non-leaders have been in the team and their technical knowledge.

RQ2: Are there differences in the leadership view between leaders and non-leaders?

Most non-leaders explicitly see leadership as a function assigned to a named person, while leaders see leadership as a collective team property.

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5 DISCUSSION

The results suggest that are similarities and differences in the way leadership activities are shared, and the differences in views by leaders and non-leaders, converge toward *a perception of leadership as situational and dynamic*, with this convergence being related to the experience and non-leaders team tenure, as well as the size and aptitude of these non-leaders to take on leadership activities. Thus, the results observed in this case study suggest that the identified theories might not be mutually exclusive (see Figure 2).

5.1 Situational Leadership Theory and Dynamic Team Leadership Theory

In SLT, leaders adjust their style based on team members' readiness and maturity levels [6], Gren and Lindman [16] identified the challenges that agile leaders face in managing group dynamics.

These challenges relate to the adaptability of the leader to the maturity of the team, with newly formed or less mature teams needing more guidance to become agile (and exercise the principle of self-management/organization), unlike more experienced teams, whose leader can adopt a mentoring or facilitating role[16]. This highlight can be compared with the teams studied, bringing the maturity of the non-leaders to a more individualized level; we observed that the leaders are always trying to adapt leadership sharing in a dynamic way (DTLT) with the non-leader members of the team according to their level of maturity (SLT). This dynamic sharing of leadership activities, which has a cyclical and iterative nature [19], offers leaders the opportunity to stimulate the individual skills of non-leaders, as well as to develop the team's SLT-related maturity [19, 22].

5.2 Non-Leaders' perspective

Another perception identified is that the non-leaders studied, with more experience and/or longer team tenure, who take on leadership activities frequently, perceived leadership as more dynamic (in terms of sharing) and less situational. In this case, situational leadership is exercised by the leader at the support and delegation level [9]. This allows these non-leaders to actively participate in decision-making and act more independently at operational and tactical levels based on their leadership skills, experience, and team tenure. Therefore, the most mature stages of SLT are a delegation of responsibility and shared leadership [6], suggesting the idea that SLT complements DTLT.

Similarly, less experienced non-leaders with shorter team tenure in both teams, who do not take on leadership activities frequently, perceive leadership as more situational and less dynamically shared among the team. According to the results, the less mature non-leaders studied tend to benefit from leadership assigned to an individual, generating greater trust among them, which ultimately allows them to make decisions with more confidence over time [16, 18, 35]. Even though agile methodologies, in their early stages, are geared towards self-managing teams that promote minimal interference from traditional managers or leaders, [22] [17]; previous research has suggested that the presence of leaders who define and reinforce team expectations can be advantageous [22], [17], [35].

5.3 Differences between Leaders and Non-Leaders' Leadership View

It was also possible to identify some patterns between the two teams studied that show divergences between leaders and non-leaders in how they view leadership. In Team A (larger team size), comprised of seven members, its non-leaders vary from experienced or with more team tenure to less experienced or with less team tenure. It can be seen that its leader perceives leadership as related to DTLT, and the majority of its non-leaders perceive leadership as related to STL. In Team B, on the other hand, made up of four members, where most of the non-leaders are experienced and have more outstanding team tenure, it was possible to see that their leader sees leadership as related to SLT and that this situational characteristic determines how they share leadership activities dynamically (DTLT), the latter being noticed by their more experienced non-leaders, as explained above. One possible hypothesis is that the *team*

size and the non-leaders' maturity may contribute to the leader's tendency to be situational or dynamic. Future research could verify the viability of this hypothesis.

Based on the assumption that leaders and non-leaders view leadership differently, although leaders may be inclined to empower non-leaders to make decisions and allocate responsibilities according to their respective experiences and skills, challenges arise because, as identified in the results, not all non-leaders possess leadership skills [1]. One possible explanation for this difference is that since these non-leaders may be more task-oriented than leadership-oriented [28], [25], especially if the leadership they receive has a more transactional style [2, 5], they may focus more on tasks and tangible results [25], without fully considering leadership-related activities. When we compare situational leadership with the transactional style, we realize that by emphasizing the task itself [2], this style suits situational leadership when the leader directs and guides non-leaders, offering rewards to followers and focusing on goals [21]. In addition, if they have no previous experience of leadership or theoretical knowledge about it, their perception of hierarchy (leader-leadership) may be sharper, leading them to see leaders as responsible for giving orders and making decisions [1], without fully considering the complexity of flexible leadership styles [2].

For non-leaders studied, with leadership skills, situational leadership aligns with a more transformational style, in which the leader focuses on the personal needs of those they lead [2]. For Walls [38], situational leadership relates to transformational leadership concepts by adopting flexibility, recognizing that situations can change and new needs can arise during the development process [38]. This corroborates the results, in which these non-leaders recognize their appointed leader, who, in this case, tends to direct and guide rather than support or delegate, as set out in SLT [18]. These assumptions may vary according to the specific organizational context and the individual characteristics of the non-leaders involved. A more in-depth approach is therefore required through additional research to explore and confirm these possible explanations.

The above findings have some implications for researchers and practitioners. While previous research has verified the opinions and work of self-appointed leaders, reinforcing the concept of leadership as a team property rather than an individual [17], the views of non-leaders need to be considered if better processes are to be followed. In this context, new insights into improvements in software team leadership can emerge.

This divergence in the leadership view between leaders and non-leaders studied gives us some hypotheses into how this might interfere in the development process, i.e., in planning sprints, resolving conflicts, making technical decisions, and changing scope, among others. Future work aims to look in more detail at the implications of these differences, including in planning, conflict resolution, technical decision-making, and scope changes, which could hypothetically affect the quality and maintainability of the software. Other hypotheses arise when identifying that *there is a relationship between the size of the team and how leadership is perceived, as well as that the team's maturity influences this perception.*

6 THREATS TO VALIDITY

Regarding the issue of construct validity, the data collection tools were adapted to capture non-leaders perspectives on leadership based on previously validated research on leadership in software teams. In the thematic analysis phase, the presence of two researchers during data collection helped to reduce researcher bias. However, limitations were identified, such as simultaneous observation of meetings and restricted access to team communication channels. However, other sources of bias may not be completely mitigated, such as the researchers' subjective interpretation of the qualitative data.

Internal validity was also addressed by the second researcher during the data collection and analysis process. However, some limitations remain, such as the impossibility of observing all the meetings simultaneously. A second round of interviews with the leaders was conducted to mitigate this bias and confirm the preliminary results. However, there may be response bias on the part of the interviewees, who may adapt their answers based on their perceptions of what the researchers want to hear or due to the context of the research.

External validity refers to the generalizability of our results. They cannot be generalized to all software development teams, although the insights are certainly valuable for agile teams with situational or dynamic leaders with transformational and transactional styles. In addition, we recognize that cultural differences may play an important role in the results, as we have focused here on two Brazilian software teams. Generalization to other cultures or types of teams should be done with caution, and more studies are needed to verify whether the results apply in different cultural and organizational contexts.

7 CONCLUSIONS AND FUTURE WORK

This study arose from the need to fill a gap in research related to leadership in software development teams, especially in teams that follow agile approaches and emphasize self-management. Existing research on leadership performance in this context is limited, especially from the perspective of those who do not see themselves as leaders. Therefore, it is crucial to integrate insights from psychological research on leadership into the SE discipline, given the intrinsically human nature of this activity [16]. The results of this qualitative case study highlighted differences and similarities in the perception of leadership between developers who explicitly do not consider themselves leaders and those appointed as leaders. Factors such as the experience of the non-leaders, team tenure, the aptitude of the non-leaders as perceived by the leaders and the size of the team were decisive in identifying the leadership theories perceived by these professionals.

In the smaller team, with more experienced non-leaders and perceived leadership skills, the leader tends to see leadership as situational, distributing leadership activities dynamically, where these non-leaders notice this dynamic form more strongly, while still seeing the role of the individual leader. In the larger team, with experienced and less experienced non-leaders, the leader tends to see leadership in a more dynamic way, and the majority of non-leaders perceive leadership in a situational way.

In general, the non-leaders studied tended to see leadership as a function assigned to a single person responsible for delegating, guiding, and responding to the team. On the other hand, the leaders studied saw agile leadership as a responsibility shared by the whole team, emphasizing team involvement in decision-making. The implications of these different perspectives need further investigation to understand their impact on the software development process. Future research could investigate the hypotheses discussed before and verify the impact of the difference in leadership vision and how this can interfere with the software development process.

ARTIFACTS AVAILABILITY

In order to promote transparency, replicability, and reproducibility, we have made our artifacts available at the following link: https://doi.org/10.5281/zenodo.12800873

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