

Leadership in Software Teams

Ayşe Betül Cengiz¹[0000-0002-4783-9191] and Kokten Ulas Birant²[0000-0002-5107-6406]

Dokuz Eylül University, İzmir 09100, Turkey
¹aysebetul.cengiz@ogr.deu.edu.tr
²ulas@cs.deu.edu.tr

Abstract. Depending on the situation encountered, the concept of leadership has a broad meaning. Each business sector needs its own type of leader. In the literature, several researchers studied this field and tried to classify styles of leaders. As a result of this, various types of leadership styles emerged. This situation has been creating confusion to determine a leader that is needed. In this paper, we reviewed the literature under two subbranches. One is the leadership in general term. The second one is the leader in software teams due the fact that our main scope is software teams. As expected, leadership styles in software teams are derived from general leadership styles. Although, researchers that worked on software teams could not create a systematic classification, we gathered some leadership styles from their papers. With the help of previous researchers, we show different leadership classes in tables. In addition, using findings from the literature, we suggest some approaches for different cases.

Keywords: Software Team Leadership, Leadership Styles, Leadership Behaviours.

1 Introduction

Not always software projects end successfully. While, in 2015, 66% of technology projects end in partial or total failure according to Standish Group's Annual CHAOS report [1], according to Scrum Inc. [2][3] 47% percentage of agile projects are late, have budget overruns, or results in unhappy customer experiences in 2020. In Table 1, software project failure rates in 2015 are seen.

Table 1. Software project failure rates [4]

	Successful	Challenged	Failed
Large	8%	26%	41%
Medium	9%	26%	31%
Moderate	21%	32%	17%
Small	62%	16%	11%

Unsuccessful software projects can cause financial damage as well as loss of life. To give an example, Raytheon promised to finish the e-border system before the early

years of Theresa May's coalition [5]. However, their fault cost £220m for taxpayers. Also, BBC squandered £100m to archive their videos that are not materialised [4].

At this point, it should be noted that the Covid-19 epidemic is among the reasons for the failures in 2020. As a result of an Australian Institute of Project Management's survey [6], 58% of organizations admitted that the impact of COVID-19 has been moderate or significant, causing project delays and cancellations in 2020.

Anyway, in [2], Scrum Inc. analysed failures and remarked leadership effects on failures. They found that if management takes five hours or longer to make decisions, the failure rate of agile projects is 22% while the likelihood of projects producing unsatisfactory results is 53%. Similarly, Wellington reported that the number of project professionals who believe that poor resource management is a significant problem in project management increased by 60% [7]. In addition, in their later report, they indicated that 25% of organizations do not leverage technology suitable for team collaborations on informal projects despite this consuming 20% of their productive times at work [8].

Also, Digital.ai worked on how to adopt agile techniques in an organization. They found that the biggest challenges are the resistance to change, lack of leadership participation, and inconsistent practices across teams with 48%, 46%, and 45% respectively [9].

According to PMI's study in 2019, organizations that have low maturity on project management technology lose the budget from failed projects 42% of the time [10].

From a different viewpoint, Harrin confirmed that almost one in five project managers has thought of leaving their jobs [11].

Even if the aforementioned studies imply different reasons for software project development, they all have a common point: inefficient or no leadership. After this point, this study compiles different types of leadership roles and behaviors from various studies. Our main purpose to prepare this paper is to draw attention to what leadership and its roles are and how to choose efficient leadership for specified situations.

In the second section of this paper, a brief history of leadership and management literature is given. In the last section, conclusions of the results of leadership approaches and our humble suggestions can be found.

2 Literature Review

In the literature of leadership-based researches, there various types of leadership roles. In this section, we present classifications of the different researcher(s) under general and software sections.

2.1 Leadership in General

In this subsection, we present the studies that are compiled from [12]–[14].

In 1990, Mintzberg [15] wrote an article about manager's roles. These roles are investigated in terms of effectiveness and ineffectiveness in the global context by [16] later. As a result of this collaborative work, Table 2 was created.

Table 2. Managerial roles in global Context [16]

	Roles	Effective in
1	Monitor: scan environments, monitor units, probe and seek information, act as corporate nerve centre of incoming information	Not effective in any context
2	Spokesperson: communicate and disseminate information with multiple levels of the internal and extra-organizational system, advocate and represent the organization	Low global context
3	Innovator: Come with inventive ideas; experiment with new concepts and ideas	High Global Context
4	Leader: motivate, coach, build teams, maintain corporate climate and culture, and supervise the work of others.	
5	Liaison: network, coordinate, link entities, and span organizational boundaries	Not effective in any context
6	Decision maker: take action, troubleshoot, make decisions, and use power to get things done.	Not effective in any context
7	Negotiator: make deals, translate strategy into action, negotiate contracts, manage conflict, and confront others	Most effective in high global context

Five years later Mintzberg's study, Denison [17] gathered his managerial roles under different names as in Table 3.

Table 3. Leadership roles for managers defined by Denison [17]

	Role	Description
1	Innovator	Come with inventive ideas; experiment with new concepts and ideas
2	Broker	Exert upward influence in the organisation; influence decision made at higher levels.
3	Producer	Ensured that I met short term stated goals; ensure that I met long term stated goals.
4	Director	Made my role very clear, clarified my priorities and directions
5	Coordinator	Anticipated problems and avoided crisis; brought a sense of order to my work
6	Monitor	Was in control of his/her work; compared records, reports and so on to detect any potential problems
7	Facilitator	Surfaced key difference among team members and then worked participative to resolve them, encouraged participative decision making.
8	Mentor	Showed empathy and concern in dealing with me; treated me in a sensitive, caring way.

On the other hand, in the literature, there is confusion between leadership styles and behaviours. However, Fries et al. [18] compiled these papers and articles from 99 relevant papers that were published in 25 different peer-reviewed journals and presented a comprehensive literature review, although their main scope is family firms.

They classified leadership roles under *autocratic*, *expert*, *laissez-faire*, *participative*, *referent*, *transactional*, and *transformational* by sticking Dyer and Whetten's work [19]. They also elaborate on the conceptual overlap with the five leadership

behaviours identified in family firm research: *entrepreneurial leadership behaviour*, *nepotistic leadership behaviour*, *paternalistic leadership behaviour*, *steward leadership behaviour*, and *supportive leadership behaviour*. Characteristics and aspects of leadership roles and behaviours were clarified in the paper. But, in order to show their overlaps, Table 4 can be examined.

Table 4. Leadership overlaps of the styles and behaviours

	Auto- cratic	Ex- pert	Lais- sez- faire	Participa- tive	Refer- ent	Transac- tional	Transforma- tional
Entrepre- neurial	M	M	L	M	M	L	S
Nepotistic	S	L	L	L	M	S	M
Paternalistic	S	M	L	L	S	M	M
Steward	M	S	L	M	S	L	S
Supportive	L	M	L	S	L	L	S

S=Strong, M=Moderate, L=Low

Until this point, we mentioned management, especially leadership, styles in general terms.

2.2 Leadership in Software Teams

An effective leadership style not only reduces the possibility of project failure but also increases teamwork efficiency, thus optimizing the time of task execution, increasing the guarantee of maintaining the scope of the project and the chance of achieving a given level of product quality [20].

Srivastava and Jain studied on a leadership framework for distributed self-organized scrum teams [21]. They interviewed various scrum teams by using a questionnaire with 13 questions and collected 16 main quotes. Based on their findings, we can classify leadership styles as below:

1. Facilitator: As the team members are expected to be self-organized, the leader acts as a coach; he or she tries to remove the impediments of the process, runs and makes decisions in the daily meetings, and validates them with the management.
2. Situational leadership: In certain circumstances, tight budgets demand team members become dynamic leaders and manage teams synchronously.
3. Rotational leadership: These leaders are rotated after a couple of months, based on their expertise.
4. Shared leadership: In few instances, it can be observed that the team size is quite large, and in certain instances, there is more than one scrum master in the team. In this case, they have to share their purpose, vision, and style of leading with others.
5. Expert leadership: The respondents agreed that one has to be knowledgeable and a continuous learner because, in each sprint, the team has to deliver full features to

their clients. Hence, it is important that the team should be guided by a person who is technically competent in every phase of software development.

6. Super leadership [22]: The most appropriate leader is one who can lead others to lead themselves.

On the other hand, Faraj and Sambamurthy [23] studied on leadership of IT systems development projects. They classified team leaders under two roles: directive and empowering. According to their questionnaires, briefly, while a directive leader has an instructive profile, an empowering leader encourages team members.

3 Conclusions and Suggestions

In this paper, as a result of a comprehensive literature review, we presented different types of management roles and leadership styles and behaviours. The term leadership is a universal concept, which can be adapted to different businesses. Since we discovered that, the literature scanned under two subtitles. The first one is leadership in terms of generally speaking. The term leadership under software teams was separated from the general term.

It can be easily implied that each software team has unique features due to their working fields. Also, each team can encounter different situations in different phases of the job. Therefore, each situation requires different types of leadership. Based on the aforementioned leadership styles and different situations, we suggest some approaches by sticking to [18] such as below:

- In tough times: Autocratic or transactional leadership styles can be a solution in order to get rid of the confusion of ideas arising from polyphony.
- When stuck at a barrier: Although the job continues to prosper, the team can encounter a barrier that did not come across before. During these times, an experienced colleague, hence expert leader can be helpful. However, even if the expert leader shares his/her experiences with the team, sometimes he has lack of skill to adapt him/her. Therefore, the team leader must mess his/her hand. In such case, a participative leader must be needed.
- When needed a little boost: After long development processes, the team might start to tire. At those times, the team may need a little boost. A transformational leader is tailor-made for that.
- Everything in the garden is rosy: If a development process goes on smoothly and healthy, a leader may decelerate the process. In such cases, each member may be their own leader. This means a laissez-faire type leadership style is helpful.

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