Leadership
Role and Importance in Software Development

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Abstract—**Leadership is the art of getting someone else to do something you want because they want to do it. Leaders help themselves and others to do the right things. They set a direction, build an inspiring vision. Leadership is about mapping out what should be done to win as a team or an organization; and it is dynamic, exciting and inspiring. In this paper, we focus on the process of leadership. In particular, we would be discussing the selection of personnel for a team and their role in achieving the ultimate goal.**

Keywords: **leadership, win, team, dynamic, inspiring, goals**

I. Introduction

Software development companies these days are aspiring to find better practices to rapidly respond to the increasing market needs, which would help in improving their profits [1]. In this search for new methods, agile software development has been introduced as one of the leading pioneers. Agile software development is said to be a pioneer because it differs from the traditional methods of leadership in many ways [2]. These methods are specially designed to cope with the dynamic nature of requirement engineering at every step of software development, which is certainly not possible in the traditional approach [3].

The key to succeeding in a software development problem is teamwork; which is also the prime concept of agile methods [4]. There is a team of developers and a manager assigned to guide them at every step. Many studies have proven that the project manager plays a crucial role in the success of a project [1]. Building an effective team, and motivating them towards achieving the goals set is the main responsibility of a team manager. According to Cohn, Mike in [6], agile project management is more about leading a team, rather than managing it. The main focus is on the value of people in software development [2].

This paper deals with the role and importance of leaders in a software development project and its application in the current work scenario. It gives a detailed description of the current work scenario and its background in section II, the choice of personnel and motivation for that choice is dealt with in section III and the role of leader in kicking off and executing a pilot project is written in section IV The activities that will be put into practice to assemble the team are also discussed.

II. Scenario and Background

We are project managers given the task to lead a software development project that is to start in January, 2017. We have to build a team of 11 software engineers for the designated pilot project. We have been given 3 people from the organization already, and the remaining 8 people can be hired by us for the project. The selected personnel for the team have been listed in Table I.

Managing a software development project is very challenging. A project manager needs precise understanding of the work that should be done in order to complete the project on time, meeting the client's requirements, and also complete the project within the budget [7]. According to the authors in [7], the key to improve the success rate for a project always lies in great management of the project team. The team processes include teamwork, cohesiveness, team learning, and communication, etc [7]. Technical knowledge and experience alone do not suffice the requirements of a team manager. Developers should also possess soft skills, also known as people skills, non-technical skills, or social skills. In [8], the author pointed out the fact that project managers most definitely should recognize the fact that the team members are as equally important as the technology and processes involved [8]. Hence, it can be said that building a strong team is the first step to success of a project. According to the authors in [14], the initial step involved in personnel selection is the identification of characteristics needed for the enhancement of work performance, that is, selection of the right person for the right job. Authors like Shneiderman, De Marco and Lister et al. have listed down factors that influence the effectiveness of teams: team members interaction, diversity related to roles, team structure, team processes and work environment which play a major role. Also, an individual satisfied with their job has been found to increase the team efficiency, effectiveness in work presented, and also the team's productivity [14]. In [8], the authors have listed a few important soft skills that are crucial for a team member to possess. They are teamwork, commitment, responsibility, analytic problem-solving, communication skills, eagerness to learn, and motivation [8].

Many team-building character traits have been identified by authors in [14], which are personality, behaviour, technical profile, productivity, individual cost, availability, project

Software Engineer Type	Experience Level	Skills	Number
Developer - Male	Senior Programmer, Married	Skillful and passionate	1
Developer - Female	Senior Programmer, Unmarried	Skillful and productive	1
Fresh Graduate Developers- 2M, 1F	Woked on one project each	Confident, team-oriented, achieving, conventional, technologically advanced	3
Relevant Experienced Developers- 2F, 1M	Medium experience	Worked together before, good communication among each other	3
Test Engineer 1 - Female	Senior Tester, Married	8 years of experience in software testing, good communication skills	1
Test Engineer 2 - Male	Fresh graduate	Works efficiently when mentored	1
Documentation Writer - Male	Professional Technical Writer	Very passionate and effective content writer	1

importance and customer importance [14]. Acuna et al. researched and found that allocation of individuals to roles based on the capabilities would show a positive result on software development [14]. Also, it has been found that task autonomy and job satisfaction are related to each other positively [14]. As project managers, we need to consider all the above-mentioned factors when a team is built.

Every project manager uses a different approach towards achieving goals of a project. Leadership has been defined in many ways out of which a few are stated here.

- According to Koontz and Weihrich, the capability to influence groups in order to achieve goals is called leadership [9].
- Fiedler states that an effective leader cooperates with the situational factors [10].
- Muller and Turner have stated the fact that there are different kinds of leadership styles for different kinds of projects [12].
- Leadership improves team communication, relationships, collaboration and cohesion [1].

The authors in [8] state the soft skills that a team leader should possess to build a successful team. Commitment towards team and its work, responsibility, proper communication, orientation with customers, respect towards and interpersonal skills would assist the leader in being successful [8]. Additionally, authors in [7] have pointed out the need to enhance the team potency in software projects. The joint belief of the team members that they can be effective is called team potency [15]. Teams that have a high team potency value have the capability to optimize the overall team performance [7] [15], which would lead to the software development at a faster pace, as they believe that they can effectively design, code, develop, produce, market and sell a software product [15]. In an agile team, the manager would be leading a team, rather than managing it [17]. The key to lead a team well, as we have discussed earlier, is having good interaction [17]. Paul Hersey proposed a situational leadership model, in which a leader would adapt their behaviour in a manner that would suit the ability and willingness of the team members [18]. According to [18], a good leader adjusts his/her behaviour towards the team along with two dimensions: task behaviour and relationship behavior [18]. The extent to which the leader can control the software development work of the team is called task behaviour [18]. Whereas, relationship behaviour is the extent to which the team leader will be able

Personnel Selected	Number
Senior Employees	2
Developers with experience from different projects (fresh graduates-developers and tester 2)	3+1
Developers with relevant experience (all have worked together before)	3
New employees (tester 1 and documentation writer)	2

to use their relationship with the team members to actually lead it effectively [7] [18].

Thus, it is safe to say that a team's major part of success depends on how well it has been built. The choice of our team personnel and respective motivation has been described in the next section.

III. CHOICE OF PERSONNEL-MOTIVATION

In this section, we intend to present the personnel selected for the team, and also the reason for their selection.

A. Choice of Personnel

Our choice of personnel for the project development is presented in the Table II. The team is thus composed of 2 recently employed developers and one newly employed tester, 3 developers with relevant experience who have worked together before, 3 developers with experience from different projects and 2 new employees- a tester and a documentation writer, who are also well experienced in their respective fields.

B. Motivation

Hiring a new employee is not an easy task. It is not just about filling an empty chair, but the responsibility of choosing the correct person for the job that would directionally influence the team. The author of [11] stated that, "No matter the size of your organization, adding a new professional to the mix makes a significant impact on your company [11]". The author also goes on to say that, it is not just about the capability of an individual to do their job, but the fact that the individual changes how the team interacts is a very crucial point to be considered [11]. So, when we are hiring new employees, the goal is to create a positive change.

A motivation for each of the above-selected personnel has been listed.

- The three developers with experience from different projects and the test engineer 2 are newly graduated from the university, and it means they have fresh knowledge and skills. They fall under the generation Y [19]. People belonging to generation Y are confident, team-oriented, achieving and conventional, not to mention technologically advanced [19]. These are some of the essential qualities that should exist in a successful agile team. Thus, adding these developers to our team would most definitely be an asset.
- There are three developers, neither senior nor junior, with relevant experience, and all of them have worked together before. We decided to include them into our team as all of them have equal experience, and they have worked together before; due to which there would be a good level of trust among them. Linberg stated in his research that trust among team members would always have a positive impact on a software development process [7]. Also, the authors in [7] have stated the fact that previous bonding among team members would accelerate greater coordination and teamwork, also knowledge sharing. This can be a very good enhancement to the team's productivity. These are the strongest attributes of an agile team. Hence, this addition to our team would definitely be an advantage to the whole team.
- Both the senior programmers all well-versed in bringing out the best from the available resources. The female senior programmer would be assigned as the group head for developers with relevant experience, as she is known for her productivity, and these developers would give her a good output whenever needed, as the communication level is also very good among them, thus adding to team potency. As the developers are not very experienced, having an experienced manager in the same field for their help would certainly bring out good results. According to [14], availability is an important criterion that should be focused on when a team is being built.
- The male senior programmer is passionate about his work, and also very good at communication skills, which we think would definitely help in leading the group of fresh graduates. Studies state that marriage affects the work timings of a person [16]. Since we know he is married, we don't expect him to work overtime; but the developers can undoubtedly excel in work under his guidance. His expert skills in communication would encourage them to communicate well with the team and they would gradually learn to trust each other with their work, which is a very important trait for a successful team, according to Linberg [7]. Also, his passion in work would definitely motivate the other developers to come up with new ideas, as that is what gen Y is specifically known for [19].
- The documentation writer and the senior tester are new employees, who would be interviewed by us personally before choosing the right persons for the team, based on the criteria such as availability, technical skills and soft skills, as only a good technician would be fit for the job. We cannot afford to be lenient with their selection, as it has been proved over years that a good guide would always promise good work despite the circumstances [20].

IV. Role as the Leader

We demonstrate the activities that will be put into practice to assemble the team, and also our roles as leaders in kicking off and executing the pilot project.

A. Activities to assemble the team

As project managers, we are responisble in leading the team towards making the project at hand successful, for which we intend to follow certain measures [7];

- The team members would be assigned tasks to be completed based on their experience, knowledge and skills.
- All the team members would be helped to understand the goals and procedures to be followed, from the beginning itself, i.e., transparency would be maintained as much as possible.
- Exchange of knowledge and skills would always be encouraged with the help of a psychologically safe environment.
- The team members would be motivated by recognition of skills and talent, encouragement from time-to-time, and financial rewards as permitted.

We could check with the management if they could create a smaller project or at least a workshop that would acquaint the selected team members with each other and also train them according to the requirements of the project as that could be a huge advantage since we would crossing the communication gap in the training itself. According to Yajun Xie, staff management is a difficult job, that could only be efficient is the team members could clearly understand the cultural differences among each other [13]. Besides, we feel that having the team members in access before the project starts in January is definitely an asset to the team leaders.

B. Role as the Leader

Keeping the success of our project in mind, we have set a few goals for ourselves;

- Increase effectiveness of work in the team.
- Ensure apt technical skills in team members.
- Motivate the team members regularly.
- Increase the potency of the project to a maximum.

We have decided that Scrum methodology is best suited for our project of software development. Scrum is an agile methodology that assumes analysis, design and development processes are dynamic in nature due to the changing requirements [3]. This technology has been adopted by many companies in recent times due to its simplicity, flexibility and productivity; which are predominantly the reasons for its success [5].

The three important roles in a Scrum team are product owner, scrum master and team members (developers, testers,

documentation writers, etc). Most importantly, a project manager is not a defined role in Scrum. A manager is not an authority [3]. The main purpose of that role is supporting the team, preventing the team members from making mistakes, and pointing out the possible issues using their experiences [3]. They are not supposed to interfere with the team's working style or any other aspect, as freedom of work has always given the best outputs according to research [5].

Based on the team structure defined in [3], we have decided to organize our team into different sections as follows: 8 developers, 2 testers, 1 document writer, 1 product owner and 1 scrum master. The developers would be assigned their roles based on their skills displayed, expertise in the work assigned and experiences relevant to the work nature. This would increase the team efficiency and effectiveness in work produced. The project manager would have to motivate the team properly so that they work up to their maximum potential. This, as said earlier, could be done using monetary rewards, personal encouragement, recognizing individual talent, etc.

In Scrum, the Product Backlog specifies the requirements that will be converted into Sprints [4]. A set of development activities will be implemented in each sprint. The Scrum team would obtain constant feedback from the product owner and users, and keeps producing (or say, enhancing) the sprints accordingly [4]. Several such sprints are produced until the end product is ready to be distributed [3].

Daily scrum meetings would be conducted on each day of a sprint to check the progress of the team, and a plan is made on what to do next [4]. The team will be able to have a clear idea of what is happening and what else should be done because of such meetings and this would be a chance for each of them to discuss the progress of the project, and give everyone an opportunity to exchange their views on it [5]. This would create a healthy environment among each other, thus increasing team spirit and consequentially, improving the productivity of the project [4].

V. Conclusion

The role of leadership and teamwork in software project development has been discussed in this paper. There are many factors that influence the development of a project. The project manager plays a significant role in the working of a team and motivating it to achieve the ultimate goal of the project. It is the project manager's role to select personnel carefully, considering all the specific characteristics that determine the success rate of a project. The project manager is never an authoritative post, but a leader who motivates their team in the right manner at the right time, always keeping in mind the task-related or project related constraints. This paper shows how a leader/ project manager can efficiently lead their team towards success.

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