A Case Study on the Need to Consider Personality Types for Software Team Formation

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Abstract. Software development is a social activity and the formation of the right team is a critical success factor. Although personality types in software teams and software projects' success criterias have been studied before, there is no well formed methodology for establishing software teams according to the personality types. This study is performed to search the relation between software team members' personality types and project success. To achive this goal, a questionnaire based approach is developed to measure project success and personality types. Two software development projects are assessed with a questionnaire that assesses project success in different aspects. Also, all project team members are assessed with respect to their personality types. Results provide insight that, personality type consideration while forming software teams can play a significant role in project success.

Keywords: Software team formation, Personality type, Project success.

1 Introduction

As software development projects are becoming more and more complicated every day, software industry continue to look for new solutions and new methodologies to improve the success rate of the projects. Time, budget, quality and scope have always been the most important factors in formulating the success of a project. Software development consists of many information gathering and information sharing activities between team members. Different individuals with different personality types work in the same group and place. Today, being a good team member has been risen as an important speciality for individuals, but it is essential that without a well formed team, an individual can not become a successful team member. Personality types can provide critical information for forming software development teams. However, research on this topic, is far from establishing a socially accepted methodology for forming software development teams according to the personality types. Software teams are usually formed according to the structure of an organization or individual experiences of project managers.

In this study we aim to find the relations between personality types and project success. We also aim to identify a more generic success definition for software projects that covers team member's motivation for further projects. For achieving

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these goals, we have prepared a questionnaire assessing project success and the effects of personality types on team success. The questionnaire consists of three sections that are Project Information Section, Personal Information Section and Keirsey Temperament Sorter [1] Section from D.Keirsey's book. After the preparation of the questionnaire, we carried out a pilot project in order to update the questionnaire. We than applied the questionnaire in two real life projects.

We have summarized the background and related research on the relation between personality types and project success in Section 2 with personality type definitions that have been used in this study. A summary of our assessment questionnaire is given in Section 3. Then, brief description of our case studies is given in Section 4. Results follow in Section 5. Our findings and conclusions are given in Section 6 together with plans for future work.

2 Background and Related Research

In this section we summarize the background on personality types and provide related research on personality type and software project success.

R.P. Oisen defined project management on early 1970s as *"the application of a collection of tools and techniques to direct the use of diverse resources toward the accomplishment of a unique, complex, one-time task within time, cost and quality constraints"* [2]. The success criteria that are included in this definition are referred as Iron Triangle. Also, the British Standard for project management BS60794 [3] 1996 defined project management as *"The planning, monitoring and control of all aspects of a project and the motivation of all those involved in it to achieve the project objectives on time and to the specified cost, quality and performance"*. These success criteria for measuring project success continue to be used today. Other writers Turner [4], Morris and Hough [5], Wateridge [6] and deWit [7] all agree cost, time and quality should be used as success criteria, but not exclusively.

The fact that software teams consist of different individuals with different personality types interacting each other in every phase of a development project, one approach states that, software development is a social activity [8]. In line with this statement, project success and personality type relation has been researched during the last decade. O.Mazni, S.Syed-Abdullah and N.Hussin have studied the effects of heterogeneous and homogenous teams on projects's success in terms of quality. And, they have concluded that heterogenous teams are more successfull in challenging projects and homogenoues teams are more successfull in straightforward projects [9]. In another study, R.H.Rutherfoord has stated that teams formed by different personality types brings more successful results [10]. In addition to these, L.Capretz and F.Ahmed has mapped personality types and software development team's roles [11] according to the role requirements and a card based approach for classifying team members according to their personality types in a periodic table format [12] has been suggested by M.Yılmaz and R.V.O'Connor.

Although roles in software development teams have been mapped to personality types with respect to role requirements, or the effects of homogenous and heteregenous teams on projects's success has been identified in terms of quality we do not have socially accepted methodology for forming software development teams

considering the personality types. To form such a methodology it is essential to have deeper knowledge on the relation between personality types and project success.

2.1 Personality Types

Based on Freud and Adler's study, Jung has classified persons according to their psychological functions in three types [13] that are identified by understanding the preferences of someone over others. In his classification, basic individual's functions are;

- differences in style of information gathering,
- decision making,
- orientation of individuals mostly interested in self (introverts) or to the outside world for external incitement (extroverts)

Myer-Briggs added new category to Jung's model for understanding individuals based on their perception and judgment characteristics [14]. Myer-Briggs personality types based on four dichotomies that are;

- (E/I) extroversion versus introversion, which is established on how an individual is energized, differences in style of information gathering,
- (N/S) intuition versus sensing, which is based on how an individual gathers information,
- (T/F) thinking versus feeling defines how an individual decides,
- (P/J) perceiving versus judging singles out the lifestyle choices of people

Then , Keirsey used Myer-Briggs types to categorize 16 combinations of Myer-Briggs Types into four [1]. These categories are;

- Artisans: ESTP, ISTP, ESFP, ISFP
- Guardians: ESTJ, ISTJ, ESFJ, ISFJ
- Idealists: ENFJ, INFJ, ENFP, INFP
- Rationals: ENTJ, INTJ, ENTP, INTP

Sixteen different Myer-Briggs personality type combinations were used in our study for personality type identification. Myers-Briggs Type Indicator (MBTI)[14] and Keirsey Temperament Sorter [1] may be used for identifying each individual's personality types. Keirsey Temperament Sorter is selected to be used in our study, because Keirsey Temperament Sorter is also used frequently for professional carrier guidance.

3 Assessment Questionnaire

A questionnaire has been prepared in order to assess the project success and personality types. This questionnaire consists of three sections: project success evaluation section that assesses the project information answered by only project managers, personal information section and personality temperament sorter section that assesses personal information and personality types respectively answered by all team members including project manager.

3.1 Project Information Section

This section consists of 34 questions which have been answered by only project managers. Main purpose is to gather information about project's schedule, budget and quality. Sample questions are listed in Table 1 below.

Table 1. Sample questions of Project Information Section

What's the planned and actual size of the project?
What's the planned and actual size of the project?
What's the planned effort and actual effort of the project?
What's the planned duration and actual duration of the project?
What's the planned budget and actual budget of the project?
Evaluate your project success with respect to customer requests and bugs found in the first six months time after delivery.
How do you evaluate the cost of the customer requests and bugs found in the first six months time after delivery with respect to your expectations?

3.2 Personal Information Section

This section consists of 13 questions which have been answered by all team members. Main purpose of this section is to gather information about personal thoughts about the project. Sample questions are listed in Table 2 below.

Table 2. Sample questions of Personal Information Section

What's your role?
What percentage of time have you spent for reworks?
What is the type of the project?
How do you evaluate the project in terms of working in a team?
How do you evaluate the project in terms of learning new technologies, tools or methodologies?
How do you evaluate the project in terms of improving yourself?

3.3 Keirsey Temperament Sorter Section

This section consists of 70 multiple choice questions and the results of each individual have been analyzed according to D.Keirsey's book. Sample questions are listed in Table 3 below.

Table 3. Sample questions of Keirsey Temperament Sorter

Is it worse to a) have your head in the clouds b) be in a rut
Is clutter in the workplace something you a) take time to straighten up b) tolerate pretty well
Are you more interested in a) what is actual b) what is possible
At a party, do you a) interact with many, even strangers b) interact with a few friends

4 Case Study

Our goal in this study is to find the relations between individuals' personality types and project success, and to define the project success in a wider perspective. To achieve these goals we have developed two systematic questionnaires to assess the project success and personality types. First of all, we have decided on our project success criteria to include traditional cost, time and scope/quality related questions and Myer-Briggs personality type definitions were used for personality type definition. The questionnaire has been applied in a pilot project. The results are evaluated and questionnaire is updated based on the gathered feedback. We than applied the questionnaires in a wider framework with two real life projects.

4.1 Research Questions

In order to find a relation between personality types and project success, we have explored the answers of the following questions:

- Are there any commonalities between team members' personality types in a successful project?
- Are there any commonalities between team members' personality types in an unsuccessful project?
- Are there any differentiation point between successful and unsuccessful teams in terms of personality types?

In order to find a relation between social success aspect and other aspects like schedule, budget, quality scope, we have explored the answers of the following question:

- Is social success of a project depends on the success of other aspects?

4.2 Case and Subjects Selection

We have three main selection criteria for candidate cases. First one is that we selected recently finished projects to be able assess the project success as we are evaluating the deviation between planned and finished values in terms of time, budget, quality and scope. Second criteria is the project team should be consisted of at least four members and at most 10 members. As the size of team might be a major factor for how an individual might participate we limit our cases to medium sized teams. Third one is that the project should be mainly a software development project.

By using these criteria, a pilot project was selected for our questionnaire's evaluation. We have assessed a research and development project completed by a team consists of four members. According to the feedbacks collected about questionnaire, we have realized that, there are some missing questions in our questionnaire like questions about project type and project customer. Also, some social success assessment questions like "How do you evaluate the project in terms of

learning new technologies, tools or methodologies?" have been inserted to questionnaire after pilot project. After that phase, one successful project and one unsuccessful project were selected in order to analyse relations with personality types. The first project was a contract based project from defense industry and was closed with a high success. And the second project was a contract based project from telecommunications industry and was failed.

4.3 Data Collection Procedure

We applied our questionnaire to a pilot project by interviews. We also gathered feedbacks on printed questionnaires. We have applied questionnaire to other two cases by e-mailing to each team member individually. And, we gathered results again with e-mails. Project success results were shared with managers and personality type results were shared with team members individually for validation.

4.4 Analysis Procedure

For evaluating project success, the answers are analysed and deviation percentages for budget, schedule, scope and effort dimensions from planned and actual values are derived. These dimensions have been named as "successful" if the deviation for that dimension was below or equal to twenty percent. Project success criteria in scope, effort, schedule and budget dimensions are listed in Table 4 below

Table 4. Project Success Criterias for Scope, Effort, Schedule and Budget

Aspect	Success Criteria	Result
Scope	Deviation below or equal to %20	Successful
	Deviation above %20	Unsuccessful
Effort	Deviation below or equal to %20	Successful
	Deviation above %20	Unsuccessful
Schedule	Deviation below or equal to %20	Successful
	Deviation above %20	Unsuccessful
Budget	Deviation below or equal to %20	Successful
	Deviation above %20	Unsuccessful

For quality and social success dimensions, all questions are answered within a scale that is from one to five. These dimensions have been named as "successful" if the median were above or equal to four. Project success criteria in quality and social success dimensions are listed in Table 5. Personality type analysis was done according to scoring sheet from D.Keirsey's book [1].

Table 5. Project Success Criterias for Social Success and Quality

Aspect	Success Criteria	Result
Social Success	Score of 4 or 5 over 5	Successful
	Score of 1,2,3nd 5 over 5	Unsuccessful
Quality	Score of 4 or 5 over 5	Successful
	Score of 1,2,3nd 5 over 5	Unsuccessful

5 Results

5.1 Results of Project-1

The project was a contract based software development project, and it was completed by a team consists of five members. Project Success assessment results for all dimensions are given in Table 6 and in Table7 below.

Table 6. Project Success Assessment Results in Scope, Effort, Schedule and Budget Dimensions

Aspect	Deviation	Result
Scope	10 %	Successful
Effort	5 %	Successful
Schedule	6.25 %	Successful
Budget	8.3 %	Successful

Table 7. Project Success Assessment Results in Quality and Social Success Dimensions

Aspect	Score	Result
Social success	4	Successful
Quality	5	Successful

With respect to the results listed above, this project categorized as a successful project as in all dimensions, our success criteria have been achieved. The maximum deviation is seen as 10 % in scope aspect. And, in terms of quality and social success, the minimum score was 4 over 5. Personality types of all team members are identified by Keirsey Temperament Sorter scoring sheet and results for each team member are given in Table 8 below.

Table 8. Team Members' Personality Types

	Team Member 1	Team Member 2	Team Member 3	Team Member 4	Team Member 5
Role	Manager	Analyst	Programmer	Tester	Quality E.
Personality Type	ESTJ	ESFJ, ESFP	ISTJ	ISFJ	INFJ

5.2 Results of Project-2

The project was again a contract based software development project, and it was completed by a team consists of seven members. Project Success assessment results for all dimensions are given in Table 9 and in Table 10 below.

Table 9. Project Success Assessment Results in Scope, Effort, Schedule & Budget

Aspect	Deviation	Result
Scope	70 %	Unsuccessful
Effort	166 %	Unsuccessful
Schedule	100 %	Unsuccessful
Budget	50 %	Unsuccessful

Table 10. Project Success Assessment Results in Quality & Social Success

Aspect	Score	Result
Social success	4	Successful
Quality	1	Unsuccessful

With respect to the results listed above, this project cannot be categorized as a successful project as in four dimensions, project goals have not been achieved. However, it was an unpredictable result that this project has been a successful project in terms of social success despite the fact that in all other dimensions, the project has been failed. Personality types of all team members are identified by Keirsey Temperament Sorter scoring sheet and results for each team member are given in Table 11 below.

Table 11. Team Members' Personality Types

	Team Member 1	Team Member 2	Team Member 3	Team Member 4	Team Member 5	Team Member 6	Team Member 7
Role	Analyst	Programmer	Analyst	Programmer	Analyst	Tester	Programmer
Personality Type	INTJ	INTJ	ENFP, INFP	ENTJ, INTJ, ENFJ, INFJ	ENFJ	ESTJ	ISTJ

5.3 Personality Type Analysis

In order to analyze the commonalities for each team in terms of personality, we have created Table 12 from our results.

Table 12. Personality Type Distribution of team members in two companies

	Team1					Team2						
	TM1	TM2	TM3	TM4	TM5	TM1	TM2	TM3	TM4	TM5	TM6	TM7
E	X	X						X	X	X	X	
I			X	X	X	X	X	X	X			X
S	X	X	X	X							X	X
N					X	X	X	X	X	X		
T	X		X			X	X		X		X	X
F		X		X	X			X	X	X		
J	X	X	X	X	X	X	X		X	X	X	X
P		X						X				

And, we have compared characteristic types according to the percentages of personality types in two teams respectively. Percentages of each personality type are given in Table 13 below.

Table 13. Personality Type Comparison in Two Teams

	Team1	Team2
E	40 %	57 %
I	60 %	71 %
S	80 %	29 %
N	20 %	71 %
T	40 %	71 %
F	60 %	43 %
J	100 %	86 %
P	20 %	14 %

We have concluded from the results of both Team1 and Team 2, Judgment (J) type is dominant in both teams with their highest percentage respectively 100% and 86% in all types. On the other hand, we have observed that Team1 and Team2 differ in gathering information type that Sensing (S) and Intuition (N) type percentages are reversed in two teams. Four of five team members have Sensing (S) characteristics in their personality type in Team1, and the percentage for having a Sensing(S) type is the second most after Judgment (J) characteristic type. But in the results of Team2, only two of seven team members have Sensing (S) characteristics in their personality and this is the lowest percentage in all types. So, we have concluded that this characteristic type of individuals may have an effect on project success. Judging (J) again has the highest percentage in all types in Team 2, and it was an expected result for software development teams, because employees in software industry usually are engineers, and they have been educated for behaving rationally at school and throughout their carriers.

6 Conclusion

In this research, we studied the relation between personality types and project success. Also project success criteria have been studied in different dimensions. We have analyzed two software projects - one was completed successfully and the other one was failed. As a result, we have identified social success as a dimension to be measured in software projects. We have observed that social success can be independent from other dimensions and can be achieved without the success in other more traditional dimensions - scope, time, budget and quality. The results show that social success should be an important aspect for formulating the software project success and software plans should include such goals as well. The early results show us that establishing a systematic methodology for software team formation is required and such a methodology can be based primarily on the personality types. However, further research is required to establish such a methodology.

In terms of personality types, we have observed that Sensing (S) and Intuition (N) dichotomy can play a significant role in project success as it was the unique differentiation point in our case studies. On the other hand, we have seen that, Judging (J) characteristic is the most common type in all twelve team members. However the amount of data we gathered so far do not allow us to perform detailed statistical

analysis to depict the relation between project success and personality types in other aspects.

We are currently extending this study with further projects for achieving statistically significant results. Our target in the first phase is to perform statistical analysis covering at least 5 projects and at least forty individuals.

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