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An empirical study to understand the effect of the awareness of Agile and Lean Software Development Life Cycle on factors to reduce the time taken for product development

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***Abstract*---**Every firm today strives to deliver its products on time. Delay in delivery not only affects the organizations goodwill but also can affect its client base. During our extensive literature survey, we found that the small firms frequently are not able to deliver their software on time. To understand this better, we performed a questionnaire survey, which revealed three major factors contributing to the delay. Over engineering, impediment to innovation and lack of essential documentation; were the four factors identified. These four factors were subjected to cross tabulation. As agile and lean development practices are implemented, the time spent on features which are not necessary is reduced, and documentation is also brought down to bare minimum. However, working on new ideas is not encouraged and is not taken in an open-minded setup. This work can be extended to determine the impact of these factors on different phases of software development.

***Keywords*---**leagile, fast delivery, cross tabulation.

Introduction

The term agile is synonym for faster delivery of products. These days the concepts of agile are coupled with lean to introduce a mechanism which includes best of both the worlds. While agile development focuses on faster delivery, lean lays emphasis on elimination of activities which do not add any value to the process.

In this paper, we have made an attempt to find the factors which can cause delay in delivery. The paper is divided into four sections- related works, methodology used, cross tabulation results and the conclusion.

Related Works

In the year 2016, Lindsjorn et al came up with a work to determine how the success of project is impact by the team which works on it. The author's intention was to find if there is any link between the quality of the team and the success of a project. According to Kalenda and team, the quality largely helps in the personal growth but is not a significant contributor for the entire team. Developing an unambiguous project(Taylor et al) is strongly related to the type of documentation. A well written set of specification ensures clarity. Bussell et al proposed a system which could automate this task. A metric is proposed which is capable of measuring the code clarity. The project can be extended to understand the role of human intervention for imparting clarity. Seguin [3] wanted to find if there is any relation between the governing principles of agile and the foundations of software engineering. The study found the existence of major similarities and minor differences which can be majorly application based. Metrics can be used to quantify (Eessar et al) the process and use of software metrics helps in streamlining the process. This paper puts forward an object based set of meta-model. If the model depicts a completion rate of less than 30%, then revision must be implemented. UI designing is often an ignored field especially in startups. The paper (Silveria et al) highlights how with limited set of resources the startups can have an (Liker et al) environment by including intuitive UI designing in all phases.

Methodology

In this work we have tried to determine the factors that lead to the reduction in time taken to complete a user activity. For the purpose of this research study we collect data from 294 software professionals working in the small and IT firms and based on the responses received from them, we shorted three factors[8][9] namely-over engineering, idea-exploration and documentation. We tried to relate these factors which the application of lean and agile practices and performed cross tabulation to understand their results better. We opted for cross tabs, as they would enable us to know the results not only specific to a group but to a sub-group as well. The details of cross tabulation results are expressed in the next section.

Cross Tabulation Results and Analysis

In this section, we will discuss the results applied from cross tabulation [10]. Two major factors are considered:

- the effect of over-engineering
- the opportunities for exploring new ideas
- under documentation

The results from the cross tabulation reveals that as the awareness of the lean and agile methodology enhances, the time spent in over engineering is

considerably reduced. This is due to the fact that over engineering is considered a waste activity and lean focuses on elimination of such activities from the process.

Table 1
The effect of over-engineering

Awareness of ALSD * Principles of LSD * Over-engineering [Cross tabulation]

Do you feel that time is spent on features not requested by customer?			Are you aware of the 7 principles of Lean Software Development? Yes	No	Total
Never	Rate your awareness of the process of agile and lean software development	Very Limited	5	4	9
		Limited	4	5	9
		Average	5	4	9
		Extensive	4	2	6
		Very Extensive	3	2	5
	Total		21	17	38
Occasionally	Rate your awareness of the process of agile and lean software development	Very Limited	9	4	13
		Limited	4	4	8
		Average	6	5	11
		Extensive	3	4	7
		Very Extensive	2	2	4
	Total		24	19	43
Fairly many times	Rate your awareness of the process of agile and lean software development	Very Limited	9	4	13
		Limited	8	9	17
		Average	4	6	10
		Extensive	7	2	9
		Very Extensive	7	5	12
	Total		35	26	61
Very often	Rate your awareness of the process of agile and lean software development	Very Limited	2	8	10
		Limited	2	3	5
		Average	8	4	12
		Extensive	6	0	6
		Very Extensive	5	7	12
	Total		23	22	45
Always	Rate your awareness of the process of agile and lean software development	Very Limited	3	3	6
		Limited	2	3	5
		Average	4	4	8
		Extensive	5	7	12
		Very Extensive	2	5	7
	Total		16	22	38
Total	Rate your awareness of the process of agile and lean software development	Very Limited	28	23	51
		Limited	20	24	44
		Average	27	23	50
		Extensive	25	15	40
		Very Extensive	19	21	40
	Total		119	106	225

Table 2
The effect of creativity

Awareness of ALSD *Principles of LSD * Opportunity for exploring new ideas

Creativity and new ideas are encouraged			Are you aware of the 7 principles of Lean Software Development? Yes	No	Total
Never	Rate your awareness of the process of agile and lean software development	Very Limited	7	4	11
		Limited	5	2	7
		Average	6	7	13
		Extensive	3	3	6
		Very Extensive	2	3	5
	Total		23	19	42
Occasionally	Rate your awareness of the process of agile and lean software development	Very Limited	5	5	10
		Limited	5	8	13
		Average	4	2	6
		Extensive	5	2	7
		Very Extensive	5	1	6
	Total		24	18	42
Fairly many times	Rate your awareness of the process of agile and lean software development	Very Limited	4	7	11
		Limited	6	3	9
		Average	3	4	7
		Extensive	6	4	10
		Very Extensive	4	5	9
	Total		23	23	46
Very often	Rate your awareness of the process of agile and lean software development	Very Limited	6	4	10
		Limited	3	6	9
		Average	7	7	14
		Extensive	6	4	10
		Very Extensive	5	8	13
	Total		27	29	56
Always	Rate your awareness of the process of agile and lean software development	Very Limited	6	3	9
		Limited	1	5	6
		Average	7	3	10
		Extensive	5	2	7
		Very Extensive	3	4	7
	Total		22	17	39
Total	Rate your awareness of the process of agile and lean software development	Very Limited	28	23	51
		Limited	20	24	44
		Average	27	23	50
		Extensive	25	15	40
		Very Extensive	19	21	40
	Total		119	106	225

As is evident from the table above, the startups are relatively very hesitant to explore new ideas as they associated with consistent amount of risk. Considering this fact, the results from the cross tabulation are in sync with our hypothesis and we can clearly see that there is not much encouragement of exploring the new path irrespective of the knowledge level of lean and agile software development.

Cross Tabulation

Table 3
The effect of under documentation

Awareness of ALSD * principles of LSD? * Under documentation[Cross tabulation]

Do you feel lack of necessary documentation adds to the complexity of task?			Are you aware of the 7 principles of Lean Software Development? Yes	No	Total
Never	Rate your awareness of the process of agile and lean software development	Very Limited	7	7	14
		Limited	2	3	5
		Average	6	7	13
		Extensive	4	1	5
		Very Extensive	5	4	9
	Total		24	22	46
Occasionally	Rate your awareness of the process of agile and lean software development	Very Limited	4	2	6
		Limited	4	3	7
		Average	4	2	6
		Extensive	5	6	11
		Very Extensive	2	7	9
	Total		19	20	39
Fairly many times	Rate your awareness of the process of agile and lean software development	Very Limited	8	3	11
		Limited	5	9	14
		Average	7	3	10
		Extensive	7	1	8
		Very Extensive	4	2	6
	Total		31	18	49
Very often	Rate your awareness of the process of agile and lean software development	Very Limited	5	5	10
		Limited	5	5	10
		Average	6	5	11
		Extensive	5	3	8
		Very Extensive	2	5	7
	Total		23	23	46
Always	Rate your awareness of the process of agile and lean software development	Very Limited	4	6	10
		Limited	4	4	8
		Average	4	6	10
		Extensive	4	4	8
		Very Extensive	6	3	9
	Total		22	23	45
Total	Rate your awareness of the process of agile and lean software development	Very Limited	28	23	51
		Limited	20	24	44
		Average	27	23	50
		Extensive	25	15	40
		Very Extensive	19	21	40

The cross tabulation results put forward a very important fact. As agile and lean methodologies do not focus much on the documentation, many of the start-ups take it as a license to skip the documentation process. As is evident, from the

tabulation results, higher the knowledge level of the these paradigm, more would be the indulgence and effort to maintain the required level of documentation

Conclusion

Identification of the factors causing hindrance in the quality production of software is pivotal to improve the overall process. In this paper we have made an attempt to identify and cross tabulate the results of three different factors namely the level of documentation, the emphasis on creativity and the impact of over-engineering on the awareness level of lean and ASD. The data for the same was conducted as a result of sample survey conducted in the small and medium level IT firms. The results reveal that as the awareness increases there is more emphasis on maintaining required amount of documentation and also there is reduction in the time spent on not-asked features. However, the freedom for creativity is still limited in such firms due to their inherent nature of not taking risks This study can be used by researchers and practitioners to understand the process better and use it for proposing ideas to enhance the process quality.

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