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Research Article

Towards a Framework for Scrum Handover Process

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Abstract: In the software industry Agile development methods are in practice at very large scale because of their ability to accommodate the change, yield quick results and provide high level of customer's satisfaction. Scrum is an agile methodology which is used for project management and software development. But release planning, documentation and scrum ceremonies are major challenges while practicing the scrum. At the completion stage of software systems, it is ready for the handover (transition) process, which is a process of transfer of responsibilities of the software system from developers to the maintainers. It is very crucial phase because smooth handover is required to avoid future problems related to the software system. This area needs to be explored more because the very little work has been done in this area. The main aim of this paper is to highlight the need of the handover process model and to suggest a framework which supports the planning and organization of handover, also provides and smooth handover process for scrum practices. We have opted the action research methodology to explore the knowledge and for developing framework. The proposed framework is evaluated through industrial experimentation and results show that the proposed solution is providing the baseline for the smooth handover of system in scrum.

Keywords:handover, transition, agile, scrum

1. INTRODUCTION

Organizations are now using the agile methods more as compared to the previous years. Most are using Scrum methodology. According to the survey conducted by Version One, 90% of respondents agreed that the agile development methods improve their abilities [1]. Scrum is the well-known way to adopt the agility because of the flexible nature and its straightforwardness [2].

The software projects are now heading towards a greater success rate than the past years. According to the research conducted by Standish group, the project resolution from CHAOS research 2012 is showing a great difference among the successful projects, failed projects and the challenged projects.

The graphical representation in figure 1 depicts the results. This clearly shows improvement in the software industry.

Challenged projects are tough in terms of time, environment, tool, budget, decisions and internal and external factors [3]. All the challenged areas that are identified have a great influence on any software system. The success of the software system is highly dependent on them. There is a clear decrease in the waterfall approach. The success percentage of the software has been increase since 2004 according to data given in [3]. It is clearly mentioned that there is no doubt in an increased use of agile development methodologies so it can be linked to the success factor of the software systems. Agility of software system has improved the success rate in recent years [1].

Agile is now considered as the universal software failure remedy. The main reason behind it is that, it allows doing small projects in an efficient way and allows the big projects to break down into

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small scalable modules, which are easily managed [3]. As agile continuously traces the progress of the team in the form of burn down charts, it helps the teams manage their velocity and complete the project successfully [4].

Scrum is a method of agile development and it is an iterative, incremental framework for development which put emphasis on the cross-functional teams working in short development bursts called "Sprints" to regularly produce a complete increment of product [5]. It is getting increasingly popular among the agile methodologies [6].

The closure of project is as much significant as its commencement. An enormous amount is invested in a software system. Clear evidence shows that the major amount of the project budget is consumed in developing, very less in project opening and project closing [7]. The major portion of a budget is normally spent on the maintenance if the project is poorly designed and developed.

Handover is a transition of a project from development phase to maintenance phase [8]. The project is now no more the responsibility of the development team, but the responsibility of the maintenance team. This is an important phase and can save the portion of a budget if performed well. Successful handover is highly dependent on the transferring party or teams [9]. It is still an uncovered area. Not much work is done in this field [10].The models described are either too old or generic, that cannot be applied to this age development methodology such as scrum. So, there is a clear need of the handover process for scrum practices which support the successful transition of the software system.

2. RELATED WORK

Handover is a research area which is still undercover. Very little work has been done in this area. Only few process models are designed, which are either too old or too generic and cannot be applied on new development methodologies like Scrum [10]. There are only three process models that describe the handover process [8]. These models are described in [11, 12, 13]. Another model which has been defined for handover process is specialized only for the one specific mid-sized organization [2]. One more handover framework has been devised by Khan [14], which describes the handover process in general and suggests the guidelines to perform handover successfully.

The publications [8, 9, 10] describe the handover process in general and also discussing the overall flow of the handover process by using its phases.

In the research area under the handover process, there exists a handover taxonomy, which is described in the publication [10].

So far, up to our best efforts, we have not found any publication that describes the model or framework for successful handover process in agile methodologies like Scrum. However, some publications are found in the perspective of evolution, maintenance and release of the software system in agile [15, 16].

Fig. 2 shows the activities of the handover process identified by the author in publication [8]. Basically, this process is divided into three sub-activities named pre-delivery , transition and post-delivery. The transition is the basic handover of the system which is performed to transfer thesystem and the set of responsibilities to the maintainers. However, this phenomenon is highlydependent on the organization's definition of the maintenance process [17].

To conduct successful transition or handover process the organization must actively participate in this process, because future maintenance is greatly hooked on the successful handover of the system.

There are several challenges that are being faced during the software handover process. They are insufficient system knowledge [8], lack of domain knowledge [8], insufficiency and lack of communication [7, 8], inadequate and improper end user documentation [7, 8], difficulties in tracking changes [8], lack of training [7] and knowledge

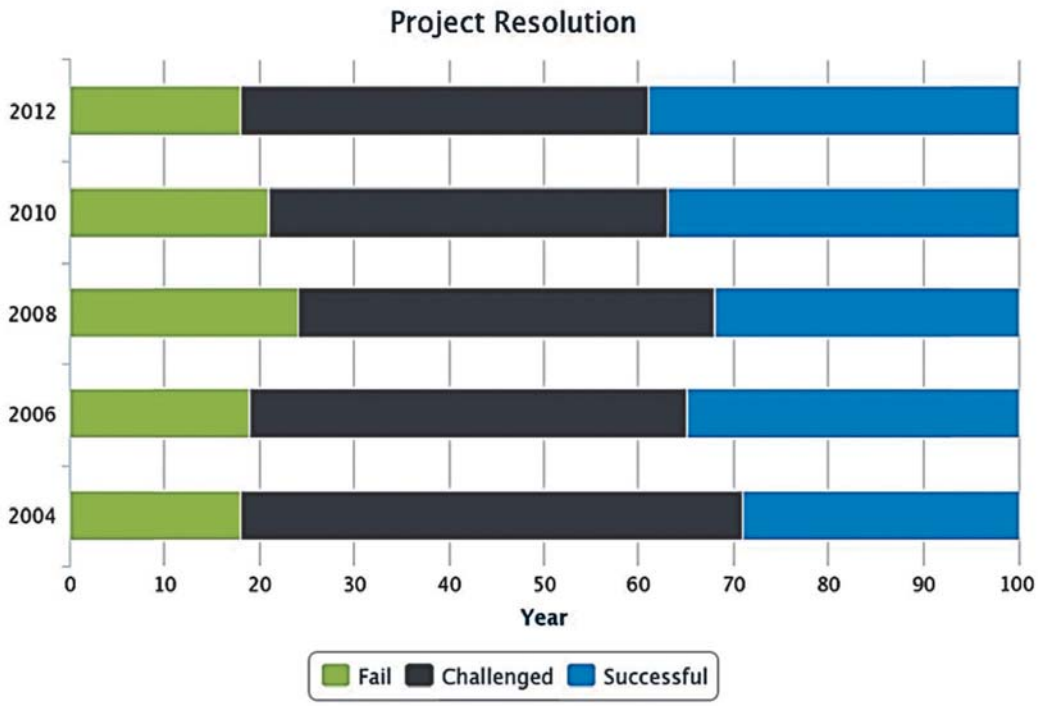

Fig. 1. Project resolution chaos 2012.

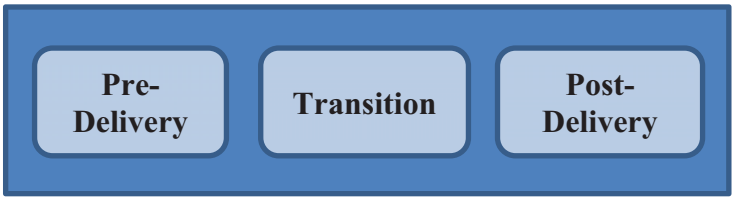

Fig. 2. Handover process.

sharing [7].

There is a need of a model or framework which handles these issues. The initial handover taxonomy has provided the base for the creation of the model or framework for the handover process [9, 10].

This initial handover taxonomy consists of seven process components, where each component comprises the set of logically akin activities mentioned in Fig. 3.

According to the 8th annual agile state survey report of Version One, 55% companies are using a pure scrum methodology. Rest of the 45% companies are using either scrum with other agile methodologies or pure agile methodologies [1].

Scrum has been a popular methodology under research since the last few years in the industry. A lot of work has been done in the scrum and it is still under discussion [5, 6, 18, 19, 20]. The work flow of scrum is described in Fig. 4.

The vision of the product comes from the stakeholders or product owner. This product vision is then transformed into the product backlog in the form of the set of requirements.

After the sprint planning the sprint backlog is prepared which contains the tasks to be done in a sprint. Every sprint has the duration of 3 to 4 weeks,

Fig. 3. Handover taxonomy process.

daily scrum meetings are the part of the sprint. Right after the completion of the sprint, a review is conducted which decides whether the product is finished or has to be improved further. When it is done, release planning is to be done after the demo meeting; if some improvements are required, then the cyclic process of scrum is re-performed [21].

3. MATERIALS AND METHODS

Scrum is the most commonly used agile methodology which provides the higher level of customers' satisfaction and easy to adopt and follow [5, 6, 18]. The authors in [22] have identified the few challenges and issues in the implementation of scrum. The major identified challenges are scrum ceremonies, documentation and the release process, which are directly related to the poor transition of the system. These may origins the ineffective handover of the system and may leads to the long run maintenance cost. The identified issues can be minimized by the well-planned handover process; this will include the proper release planning, documentation and ensures the communication required for the shifting of the software system from developers to the maintainers. This recognizes the clear need of the proper handover process for scrum practices.

The research methodology we have adopted is Action Research. The reason behind the selection of action research is the approach of learning by doing. It provides an iterative way to solve a problem and gives quick results. The detailed methodology is described in Fig. 5. At every stage of action research we have used different methods to execute action research successfully. Literature survey has been done to diagnose the problem. In action planning exploratory study issued to get the maximum knowledge about the handover process and scrum. After studying the problem, data are systematically gathered and arranged by performing a systematic literature review (SLR). A review protocol for SLR was opted as mentioned by Verner et al [23]. The motivation behind conducting SLR is to highlight the reasons and needs of the framework. At the stage of action taking a framework has been proposed to conduct successful handover process for scrum practices.

The process flow of activities with respect to the handover and agile is described in Fig. 7.

The process activities of the handover process are described in Fig. 3 and the process activities of agile with respect to the scrum phases are mentioned in the Table 2.

These activities are divided into three sub-activities according to the handover process flow. Pre-delivery, transition and post-delivery as described in Fig. 2. This division is done according to the flow of handover as described by Khan and Mattson [24]. The belonging of the activity to the phase (pre-delivery, transition, post-delivery) is done according to the activity definitions given by Khan and Mattson [10] for handover and by Mattson and Nyfjord [15] for a scrum.

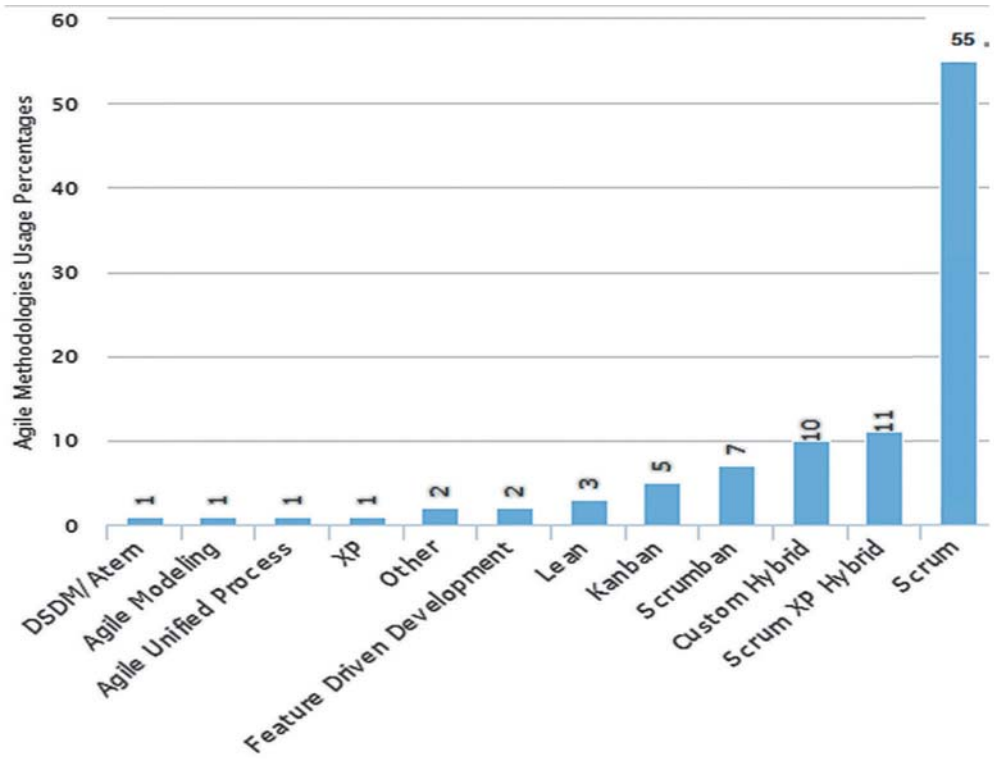

Fig. 4. Popularity of scrum.

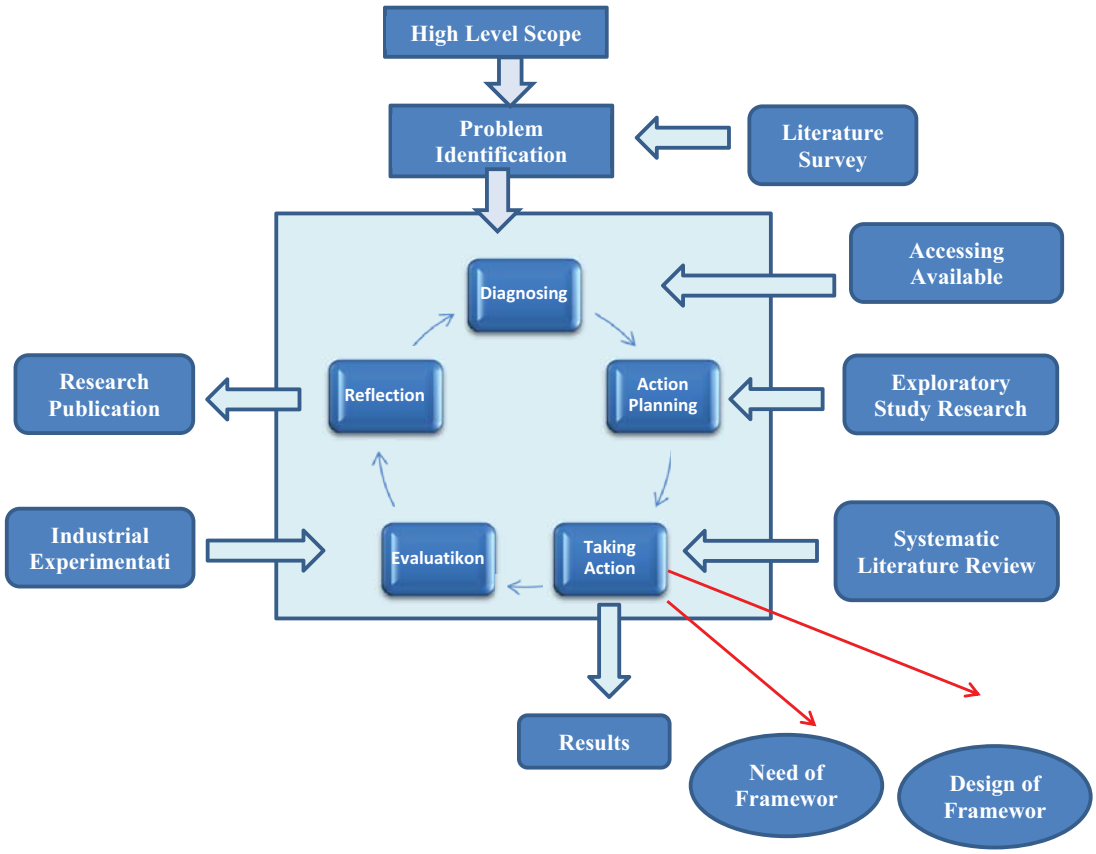

Fig. 5. Action research.

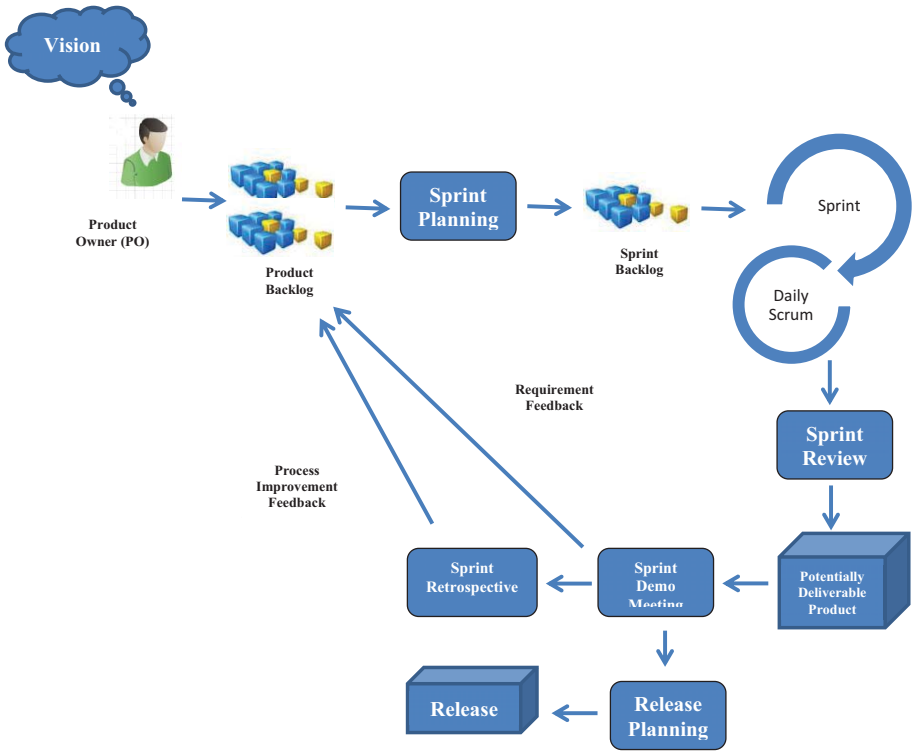

Fig. 6. Scrum process flow.

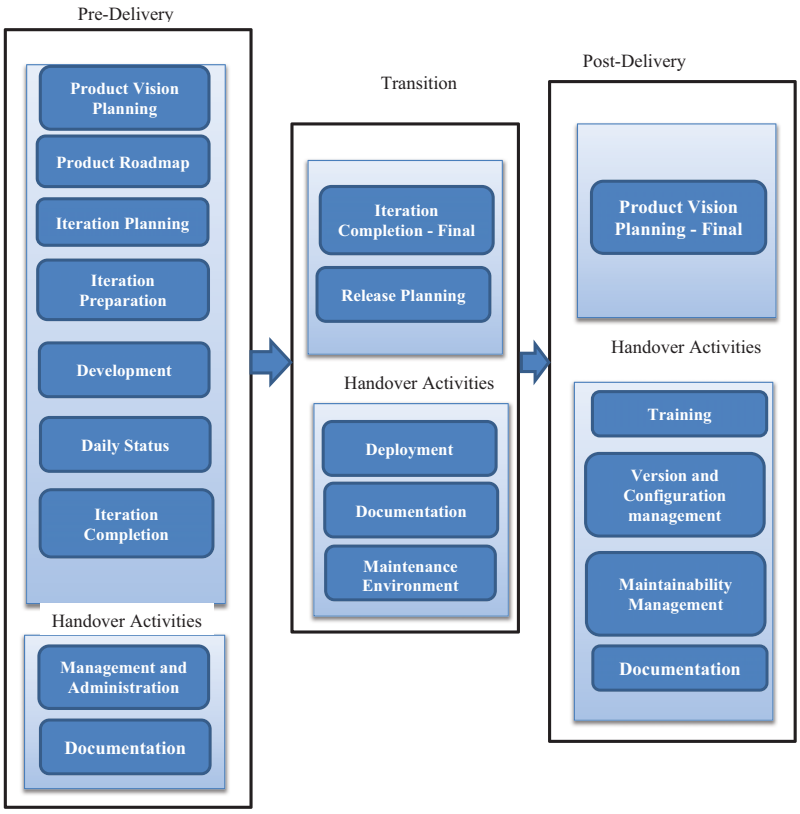

Fig. 7. Activities division in handover process.

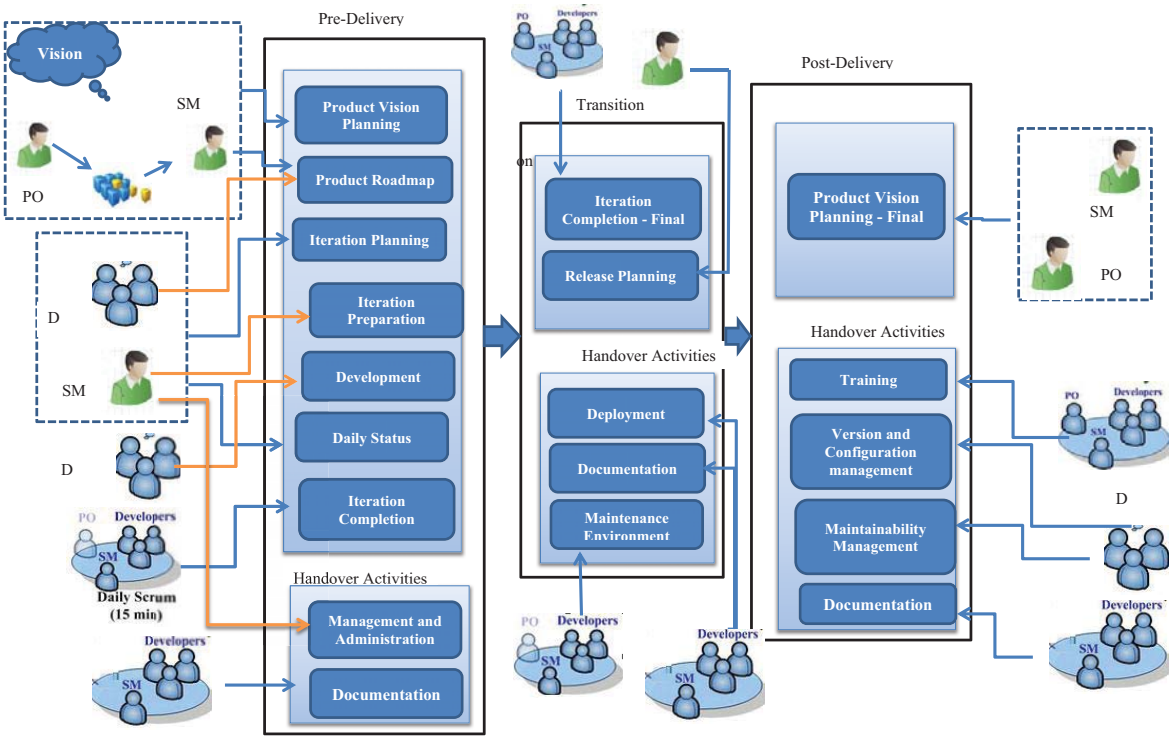

Fig. 8. Proposed framework.

A.	**Interviewee's Information**
1	What is your name, email and phone number?
2	What is the name and address of your company?
3	How many employees work in your organization?
4	What is your position and role in the company?
B.	**Handover Usage**
5	Are you familiar with the term 'handover'?
6	How a project does moves from developers to maintainers in your company?
C.	**Development Methodology**
7	Which development methodology does your organization use? (Scrum, XP, Waterfall etc.)
8	Does your company dealing with global software development?
D.	**Activities included in Handover**
9	Which activities are included at product owner's side?
10	Which activities are included at scrum master's side?
11	Which activities are included at development team's side?
E.	**Proposed Framework's Evaluation**
12	Does the proposed framework is feasible?
13	Did it help the organization to successfully handover the software system?
14	Is there any activity missing in the framework? If yes, please name it.
15	Do you feel that this framework is adoptable by industry?
16	List down the area of improvement in the framework

Fig. 9. Questionnaire.

Table 1. Project resolution from chaos 2012.

	2004	2006	2008	2010	2012
Successful Projects	29%	35%	32%	37%	39%
Failed Projects	18%	19%	24%	21%	18%
Challenged Projects	53%	46%	44%	42%	43%

Table 2. Agile process phases [15].

S. No.	Agile Processes
1	Product Vision Planning [15]
2	Product Roadmap and Release Planning [15]
3	Iteration Planning [15]
4	Iteration Process [15]
5	Daily Status [15]
6	Development [15]
7	Iteration Completion [15]

According to the proposed model as shown in figure 8, scrum master and team are carrying out their scrum responsibilities and in addition they are assigned three activities of handover in pre-delivery phase. Scrum Master is responsible for the management and administrative activity, scrum master with his team is responsible for developing and managing the maintenance environment. The role of product owner in this activity is either visible or invisible depending upon the nature of the product being in the sprint. In this phase documentation is also the responsibility of the scrum master and his team.

The second stage is the transition. During this phase scrum master is responsible for release planning and scrum master along with his team is accountable for the iteration completion, deployment and documentation.

The last phase is post-delivery. Scrum master and the team are responsible for the checking of the product according to the product vision. They also have to maintain the documentation for this stage. For maintenance, proper version and configuration management are also handled by them. For the training's activity product owner has to be with scrum master and team.

4. RESULTS AND DISCUSSION

To evaluate the work done is an important phase in the action research. After proposing the framework we have validated it through the expert reviews and participatory research through industrial experimentation.

4.1 Industrial Experimentation

The evaluation has been done through the industrial experimentation. For this purpose, Assessment Factors (AF)were defined to measure the satisfaction level of the participants. These factors were AF1-System Knowledge, AF2- Domain Knowledge, AF3-Efficient Communication, AF4- Maintenance of Documentation, AF5- Tracking Changes, AF6-Proper Change Planning, AF7-Training and AF8-Knowledge Sharing.

Total participants in this experimentation were sixteen. The threat for the validation was the selection of participants and their poor background or domain knowledge about the handover and

Table 3. Evaluation on basis of assessment factors.

Assessment Factor		Strongly Agree	Agree	Satisfactory	Disagree	Strongly Disagree	Satisfaction %
System Knowledge	AF1	7	4	3	1	1	87.5 %
Domain Knowledge	AF2	7	5	2	2	0	87.5 %
Efficient Communication	AF3	8	2	5	1	0	93.7%
Maintenance Documentation	AF4	5	6	4	0	1	93.7%
Tracking Changes	AF5	4	5	4	2	1	81.2%
Proper Change Planning	AF6	4	5	6	1	0	93.7%
Training	AF7	4	8	2	1	1	87.5%
Knowledge Sharing	AF8	6	4	2	1	3	75.0%

Table 4. Comparisons with old models.

Contributions	Proposed Model	Existing Models					
	Handover for Scrum	EM3: Handover Framework	Laine Markus	Thomas Vollman	Thomas Pigoski	ISO/IEC 14764	ISO/IES 15288
Handover Roles	✓	✓	✓	✓	✓	X	X
Handover Practices	✓	✓	✓	P	P	X	X
Handover Activities	✓	✓	✓	✓	✓	P	✓
Handover Lifecycle	✓	✓	X	X	X	X	X
Handover Guidelines	✓	✓	✓	X	X	X	X
Agile Practices	✓	X	X	X	X	X	X
Scrum Activities	✓	X	X	X	X	X	X
Division of handover activities for each phase	✓	✓	X	X	X	X	X
Division of agile activities for each phase of Handover	✓	X	X	X	X	X	X

✓= "exists" X = "does not exists" P = "partially exists"

scrum. To avoid this problem, we assured the right selection of participants by measuring their background knowledge. Also, they were provided with the sound knowledge about the handover process by a conducting short duration session of the meeting.

Predefined questionnaire templates were used to keep the uniformity and maintain the standard of the reviews about the proposed framework.

Figure 9 shows the questionnaire. Part A, B, C and D include the questions for the understanding of the handover process in industry. The part E contains the questions for the evaluation of the proposed frame work.

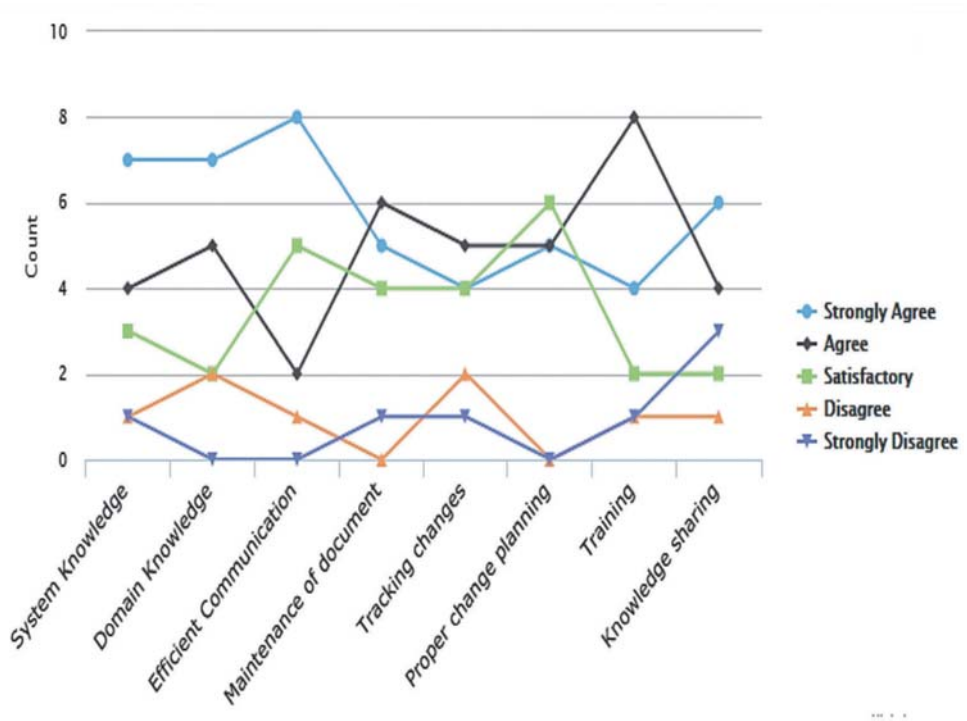

Fig. 10. Trend of satisfaction level.

For the evaluation purpose our primary focus was on the evaluation on the basis of assessment factors; defined above. Questions of part E were considered for the improvement in the proposed framework. The results for the evaluation of proposed framework on the basis of assessment factors are shown in the table 4. Each assessment factor is evaluated by sixteen participants. The number of participants against each factor shows their satisfaction level.

The results clearly show that the majority of participants were strongly agreed, agreed or satisfied for all the assessment factors; however, few disagreed against each assessment. The trend is shown in the figure 10.

From the trends of results of this industrial experimentation; explained in figure 10, it can be evidently seen that the participants have shown their confidence on the proposed framework of the handover process for scrum practices.

4.2 Comparison with Existing Models and Frameworks

A comparison with the existing models, framework and ISO/IEC standards is given in Table3. The comparison illustrates that the previous models or frameworks defined were generic and did not incorporate scrum practices in them but the proposed framework describes the handover process practices with incorporation of scrum practices. This will help the software industry to adopt the proposed solution for successfully performing the handover process.

5. CONCLUSION

The scrum development method is widely used in the software industry for gaining the high level of customer's satisfaction. On the contrary handover process is in its initial stages. The piece of research done in this area is very small. Up till now, no model had been devised which deals with the handover process for scrum practices. In this paper, we have highlighted the deficiency of scrum that leads towards the poor transition or transition failure. Our main contribution is the basic framework of the handover process for scrum practices. This will help the industry to plan and conduct the smooth transition of the software system. It provides the overall flow of the transition or handover process, which will assist to organize the handover process from the very beginning of the system till its end. However, this framework has the tendency to improve and incorporate detailed guidelines.

In future this framework is intended to be enhanced with more details in order to perform handover more appropriately and successfully. Post-delivery phase needs to be defined more precisely so that the roles and responsibility at this phase can be demarcated more clearly.

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