

Investigating the Gap between Scrum Theory and Practice in Pakistan

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Keywords: Scrum, Agile Software Development, Theory Practice Gap, Software.

Abstract: Theory and practice gap highlights deviations thus projecting any changes that hindered theory less beneficial. Among the companies that practice agile, the most common methodology is Scrum. Scrum advocates strict adherence to the original theory until it's successful prevalence in the organization. Industrial investigation is conducted in this research to reveal practice theory gap in case of Scrum thus providing detailed insight into the matter. It concludes with a set of guidelines for optimal Scrum implementation by addressing the gap in depth.

1 INTRODUCTION

Scrum (Schwaber, 2011) is an agile framework in which a software is developed incrementally via short iterations lasting from one to four weeks. Introduced by Jeff Sutherland and Ken Schwaber, the framework's main emphasis is on changing the work environment and mind set of teams, making them cross-functional and self-organizing.

Theory of Scrum provided in a standard Scrum Guide, is simple and concise and adherence is advised to reap full benefits of the method. However, Scrum is hardly ever used in accordance with the theory giving rise to the theory-practice gap. The adaptation in Scrum practices should be based on past experiences and not one's own interpretation.

Section 2 comprises existing work, section 3 provides details of how interviews were conducted and analyzed. Section 4 gives insight into the proposed solution. Section 5 comprises concluding thoughts.

2 BACKGROUND

Sverrisdottir et al. (Sverrisdottir, 2014) have compared the perception of product owners (PO) of their roles with the role of product owner according to Scrum theory. PO role is hardly ever in conformance with Scrum recommendations. Also the study reveals that Scrum is hardly ever used

exclusively rather a combination with other practices/methods is favoured. A survey was conducted by Salo et al. (Salo, 2008) in order to show the extent of adoption of XP and Scrum in European embedded software industry. It indicates expected usefulness of these methods when there is no background experience as well as actual level of use of practices where agile methods are systematically used. The study reveals that the usage of Scrum practices is more method specific as compared to XP, still major deviation exists as some practices such as Sprint planning are not necessarily popular. Kurapati et al. (Kurapati, 2012) conducted an online survey that shows compliance of industry with XP and Scrum practices. Survey results show that a combination of methodologies is favoured as compared to using one methodology with all its practices. Zieris et al. (Zieris, 2013) compared intended way of proceeding with actual process and practices of two Polish Scrum teams. Using Scrum Guide as standard, they closely observed practices of both the teams. Their observation revealed that additional practices were introduced into the method and also some XP practices were also added. M. Bass (Bass, 2012) have conducted a case study involving 19 practitioners from seven international distributed organizations. The main purpose of this case study was to find out trends in agile process tailoring. Not many changes are made to Scrum process i.e. most of the practices are performed in most of the organizations whereas only selected practices of XP are followed. Eloranta

et al. (Eloranta, 2010) have classified deviations from Scrum into two categories namely ScrumBut and ScrumAnd. They refer incomplete adoption of Scrum as one of reasons for low success rate of Scrum projects. Overhage et al. (Overhage, 2012) have investigated developer's acceptance or reluctance towards Scrum in real scenarios in depth. They presented a model that can be used to developer acceptance of Scrum as well as validation of developer acceptance level afterwards. Ovesen et al. (Ovesen, 2015) conducted a case study of seven integrated systems development companies and used semi-structured interviews to find out team composition challenges faced by these companies when they implemented Scrum. The paper shows that companies deviate from Scrum based on their own interpretation and suitability.

From the analysis of literature, we see that there exist many articles that compare core principles/practices of Scrum with how the method is actually applied in the industry. However there are limitations. According to our knowledge, none of the currently conducted studies covers all the practices from Scrum theory and none of these studies goes into the depth of Scrum theory i.e. into the details of Scrum practices provided in the Scrum Guide. Also, post deviation identification none of the related articles propose any solution for the problem even though deviation is deemed harmful (Kurapati, 2012).

Another gap observed is that despite being the most common agile method used, we rarely see any studies on Scrum beyond the adoption stage. Especially in the context of Pakistani software industry we hardly see studies that explore Scrum process implementation at all.

Hence through this study, we tried to analyze and present a solution to the gap between Scrum theory and practice in Pakistan.

3 RESEARCH METHOD

Multiple research techniques were combined and used while conducting different phases of research. Semi-structured interviews were conducted to gather data from Scrum practitioners from organizations of varying sizes. Data was analyzed via thematic network analysis. Focus group was used as means to validate the findings.

3.1 Interviews

Semi-structured interview (Jacob, 2012) technique was chosen as a data collection method since it

provide in-depth understanding of the context which was mandatory in our case. Also an interview guide ensures common structure thus making results comparable. After reading the background material on Scrum, initially an interview protocol was prepared in which questions were included related to all Scrum practices (roles, events, artifacts) as described in the Scrum guide (Schwaber, 2011). Questions from Nokia Test (Eloranta, 2010) were also included. A good interview protocol is constructed in a way that the questions asked connect with the informants (Jacob, 2012). Following Spikard's (Jacob, 2012) guidelines and keeping the flow of Scrum activities in mind, interview protocol was revised again and questions were re-assembled. The final interview questionnaire consisted of three parts.

Part A constituted of questions related to

- The background of the interviewees
- The organization

Part B had questions related to inception and background of Scrum within the organization

Part C consisted of questions related to core Scrum practices as enlisted in the Scrum guide.

Except for the closed ended questions related to presence of core practices, most of the questions were mainly open-ended. After forming an interview protocol, a pilot test was conducted which revealed a few flaws in interview design. This test was conducted with a Scrum practitioner with educational and research background in agile and Scrum. The interview lasted 45 minutes. After the pilot test, interview protocol was revised and finalized.

In the third step the interviews were conducted among various role titles (Table 1). Size of the organizations ranged from Medium (<250 employees) to Large (>250 employees). Out of seven contacted organizations known to use agile, five claimed of using Scrum. Response rate was high. Five out of five contacted organizations agreed on letting us study the methodology of their organization.

Table 1: Distribution of roles.

Role title	Interviews
Scrum Master	8
Developer	11
Manager	1
Project Manager	2

The interviews that were conducted over a span of 6 months, generated very useful data related to Scrum

practice. A number of deviations were revealed which were categorized into different standard Scrum practices in the Scrum guides. Cross-questioning was done to reveal causes of deviation. The interview data was analyzed again to find out the causes of identified deviations. Root cause analysis (Williams, 2001) was performed to dig deeper into deviation reasoning so that guidelines could be formulated. Once the guidelines were established, they were validated by a Focus group (Krueger, 2014) of experts. Bulletin board format of online focus group was chosen. Focus group revealed a few changes in the proposed solution hence the proposed solution was revised in the light of expert guidance.

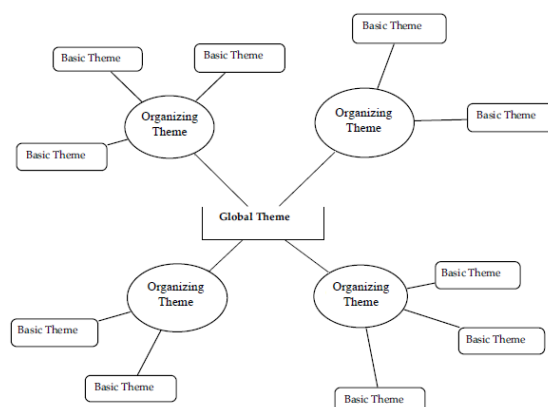


Figure 1: Thematic network analysis.

4 ANALYSIS AND RESULTS

4.1 Deviation from Scrum Theory

The deviations were revealed via Thematic Network Analysis (Gill, 2015). Data from primary studies such as interviews consists of numerous concepts that need some refinement and restructuring to answer the research question. Thematic network analysis serves this purpose. It is a detailed step-by-step process: The first step of thematic network analysis consists of identifying category codes. A category code is a suitable name that represents a set of related concepts in interview text. The purpose of this step is group concepts into manageable chunks on basis of which a thematic network can be established. Then we look for basic, organizing and global themes in the underlying knowledge.

Second step is development of thematic network based on concepts in each category. Thematic network consists of themes at three levels. Lowest level theme is basic theme that groups concepts under a concept category at lowest level. A set of basic themes is further grouped into an organizing theme and finally a set of organizing themes are grouped into a global theme which is the highest-level theme. This way a network of themes is developed by analysis concepts repeatedly (Figure 1).

Since interview protocol was designed using Scrum guide, it rendered the first step very easy as 11 category codes were recognized right away consisting of main Scrum practices. Three of these category codes representing deviation from Scrum roles of Scrum Master, Product Owner and development team, three representing deviations from Scrum artifacts of Product Backlog, Sprint backlog and Increment, one representing deviation from the Sprint

Table 2: Deviation from Scrum theory.

Deviation	Frequency	Percentage
Role specific titles for Development team members	18	73%
Development Team is not self-organizing	15	68%
Progress not monitored	13	59%
Definition of Done not used	13	59%
Development Team is not cross-functional	13	59%
Sprint retrospective not held	11	50%
Product Owner does not exist	10	45%
Scrum Master is partial Product Owner	10	45%
Estimation is not performed by the Development Team	8	36%
Sprint Review not held	8	36%
Product Backlog not used	7	32%
Sprint Backlog not used	7	32%
Requirements are signed off	7	32%
Daily Scrum not held	6	27%
Scrum Master is not called Scrum Master	6	27%
Scrum Master does not exist	2	9%
Product not developed in Sprints	2	9%

and three representing deviations from Scrum events of Sprint Planning, Sprint Review and Daily Scrum. One category of additional practices was identified from interview data. 35 concepts were then found related to the identified category codes. Then these 35 concepts were reduced to 17 basic themes i.e. the deviations practiced. The thematic network analysis was only used till this step as it served its purpose.

The most common deviation found was the use of “Role specific titles for Development Team members”, This deviation is practiced by 18 out of 22 teams interviewed. This practice is closely followed by “Team is not self-organizing” deviation occurring in 15 out of 22 cases. Other notable deviations observed include “Product Owner does not exist”, “Definition of Done not used”, “Development Team is not cross-functional” (Table 2).

4.2 Causes of Deviation

Once deviation was identified in Scrum theory, the interview data was reanalyzed to identify causes of those deviation. Follow-up questions were asked from interviewees via email when needed. Once the causes of each deviation were identified Root Cause Analysis (RCA) (Williams, 2001) was performed. RCA is used to get deeper insight into the problem at hand so that solution can be identified. More specifically 5-Why Analysis (Williams, 2001) technique of RCA was used as causes were identifies via interviews. 5-Why Analysis is a Six Sigma technique in which why to a cause is recurrently asked until the root cause is reached. An Excel tool designed by Bulsuk et al. (Bulsuk, 2009) was used to perform 5 why analysis (Figure 2).

Why 1	Why 2	Why 3	Why 4	Why 5	Root Cause	Recurrence Prevention
Resources unaware of the practice	They are not trained on Scrum	Unaware of the fact that resources should be trained	Scrum was introduced without sufficient knowledge	No planning went into the method introduction	Insufficient strategic planning	
		Scrum trainings are not the top priority of management	Following the process accurately is not the main goal	Deviating version of the method is working just fine	Unsupportive management	
People only do role specific tasks and are always known by that role	Resources do not have multiple skills	Resource experience is limited to a certain area only	Cross-skill development is not done	Cultivating generalist skills is not a part of industrial culture	Specialist culture	
Arrow Toolbox Use these arrows and lines to show the chain-of-thought between the whys.						

Figure 2: 5-Why analysis.

To have a clearer picture of root cause analysis RAWGraphs tool was used (Figure 3). Thickness of the lines represent how frequently certain root cause occurs for a deviation.

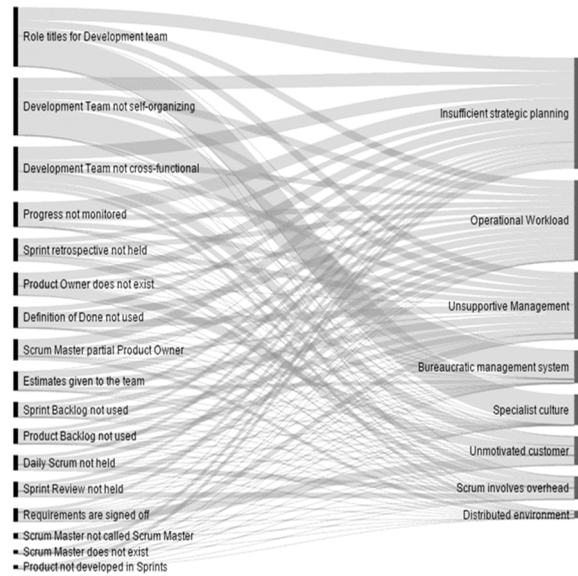


Figure 3: RCA Visual.

4.3 Proposed Guidelines

A set of guidelines was devised to lessen the noted gap. The source of guidelines included literary best practices, interviewed teams that complied with Scrum and literary articles. The guidelines consisted of three phases namely, process preparation, process commencement and process propagation (Figure 4).

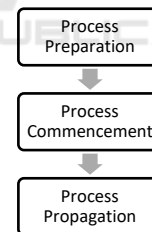


Figure 4: Solution Phases.

4.3.1 Investing in the Process

Only 32% of the Scrum masters among the interviewed teams actually claimed to receive formal Scrum training thus indicating reluctance from the management end to invest in the process.

Management Persuasion

Approval by upper management is critical to fund any trainings. Convincing them by highlighting benefits of process investment (Hajjdiab, 2011) along with a thorough introduction to methodology could be promising.

Reducing Work Pressure for Dedicated Scrum Implementation

Resources are so dedicated to the operational work and fire fighting that they cannot be trained on the process. Investment of more time in agile adoption by reducing the workload for a bit as Scrum implementation cannot be rushed and it must be preceeded by an organizational change.

Strategic Planning

The main root cause of deviation being the lack of strategic planning prior to the adoption of the method. Choosing work best for them is up to the organization. Haque et al. (Haque, 2008) chose to introduce Scrum incrementally. Play Zero (Leffingwell, 2005) is a series of steps recommended by Ken Schwaber that are to be undertaken before method commencement. It has two stages. First one being overview and assessment (Figure 5) and second being pilot preparation.

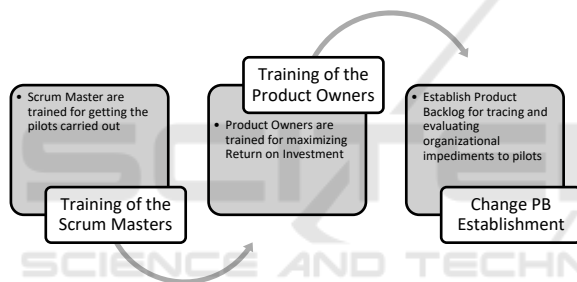


Figure 5: Play Zero - Stage 1.

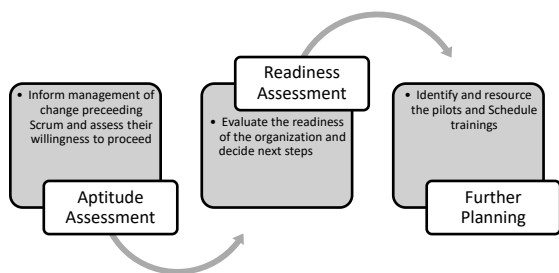


Figure 6: Play Zero – Stage 2.

Customer Involvement

The core of agile is customer involvement. 50% of the customer to get hand on with the project. Ambiguous requirements lead to rework and other issues.

“When these people [customers] are not there, actually see the product after a few sprints, cause problems as they don’t have the complete picture.”

Mainly, the customers merely don’t see the point of being involved with the development out-and-out. Agile teams (Hoda, 2011) deal with these issues with the following contingencies

a. Selling Advantages

Holding sessions with customers who are unwilling to collaborate to begin with might persuade them to change their minds. Once idea of agile clicks, they might be willing to get a little more involved.

b. Changing Requirement Priority

Due to the lack of customer involvement, sometimes the team makes assumptions about requirements thus creating features that the customer did not want. A counteractive strategy is to change the priority of ambiguous features awaiting clarification and build features that have more distinct specification.

c. Customer Proxy

When the customer is collaborating but is reluctant to wear the hat of PO, a customer proxy can be appointed. Duties include requirement clarification and eliciting feedback.

d. Frequent Demonstration

One way to ensure involvement of a disinclined customer is to create more frequent demos thus achieving customer collaboration to some extent.

4.3.2 Process Commencement

Conducting Pilot(s)

Conducting a pilot before organization-wide expansion should be mandated to test the waters (Hajjdiab, 2011). Pilot should be chosen keeping these things in mind:

- a. The pilot should span around the middle of average length of projects conducted
- b. It should be small enough to be doable by one team
- c. It should not be a critical project

Once conducted, pilot should be assessed and adjusted. Retrospect to assess impediments, improvements and ROI.

Organizational Expansion

At this stage, the outcome of the pilot(s) should be made available to everyone in the organization. Initiation of many development projects is started based on the outcome. There are values that need to

be established for Scrum to flourish, which like all good things takes time and effort.

From Bureaucracy to Autonomy

Expecting organizational culture to change overnight from current 'command and control' to the flat management is not the solution. The remedy to this problem (Moe, 2009) is team autonomy. Chung et. al (Chung, 2009) have presented a scenario in which a Scrum team at Yahoo managed to thrive in predominantly command and control culture. With the right guidance, this can be achieved over time.

Handling Distribution

Scrum in distributed environments needs proper collaboration tool. Currently 75% of the distributed teams use emails for collaboration. There is no central repository of data for transparency to prevail. Distributed environment is not ideal but is still doable as demonstrated by Rayhan et al. (Rayhan, 2008) where Basecamp is used to handle distribution. Team J and K who have PO residing abroad are using TFS. 85% of the teams have issues due to time zone differences. Team J and K have resolved this by changing their work hours to the team that resides at another continent thus resolving this time zone issue created by distribution.

4.3.3 Process Propagation

Method Assessment and Retrospective

Measuring progress with Scrum vs other projects might help organizations realize what suits them best (Rayhan, 2008). Scrum enables self-improvement to the method in itself by highlighting what needs to be changed for Scrum to flourish. The key is to use Scrum as a process for implementation and scaling of Scrum in the organization. Method retrospective by a highly trained and skilled Scrum Master is the key to this all.

Handling Smells over Time

A *Smell* is an issue that arises as an indicator of not following the method correctly. A skilled Scrum Master promptly addresses the issue by investigating what's the real cause. Interviewed teams predominantly feel overwhelmed by using the method as mostly Scrum is pushed upon them and the teams are not internally motivated causing *smells*. One suggestion would be the use of continuous learning tools such as Agile Meeting Cube which provide teams with why of each practice in depth.

Another suggestion would be to have more studies like this in the future and make the deviation drawbacks as known to the organizations that are practicing or rather mal-practicing the method.

4.3.4 Guideline-Root Cause Relationship

Although guidelines were designed to be systematic, certain clauses specifically target particular root causes (Table 3).

Table 3: Guidelines and targeted root causes.

Guideline Clause	Targeted Root Cause
Management persuasion	<i>Unsupportive Management</i>
Reducing work pressure for dedicated Scrum adoption	<i>Operational workload</i>
Introducing the Play Zero	<i>Insufficient strategic planning</i>
Removal of stringency in roles	<i>Specialist culture</i>
From bureaucracy to autonomy	<i>Bureaucratic management system</i>
<ul style="list-style-type: none"> • Selling Advantages • Customer proxy • Frequent demonstration • Pay for collaboration • Change requirement priority 	<i>Unmotivated customer</i>
Making continuous learning tools available	<i>Scrum involves overhead</i>
<ul style="list-style-type: none"> • Tool support • Synchronizing work hours 	<i>Distributed environment</i>

5 CONCLUSION

Significant deviation exists between theory and practice of Scrum. The revealed gap highlights that there is need for educating people on Scrum. Also there is a need for a cultural shift that promotes flat management over a hierarchy.

The study helps fill the gap to some extent as illustrated by guideline-root cause relationship. Availability of tools that facilitate employee learning on the method within the practicing organizations will help the matter significantly. Shift in management mindset is crucial which will facilitate removal of stringency in roles and bureaucratic management

system which are seemingly the biggest barriers to implementation accuracy. The next part of the research constitutes implementation of the guidelines in SEMAT as means of standardization. The research continues further and validates the solution by field experts by means of a Focus Group discussion.

ACKNOWLEDGEMENTS

We would like to express gratitude to all the people involved in the interview process via personal connections and LinkedIn.

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