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A Human Factors Study of Risk Management of Complex Agile Scrum Projects in Large Enterprises

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Abstract

Agile Project Management methods have gained phenomenal success in the IT software world in managing projects of high complexity and uncertainty. However, Agile projects come with their unique set of risks. This paper seeks to explore the risks posed by human factors to complex Agile Scrum projects in large enterprises. Project Risk Management is crucial in determining the future performance of a complex project. Increasing project complexity makes it more and more difficult to anticipate potential events that could affect the project and to make effective decisions to reduce project risk exposure. This is even more true for Agile projects that promote immediate and frequent visibility of risk factors and distributed decision making in projects. A dominant reason for failure of complex Agile projects are the risks caused by human and organization factors. This paper will analyze the delivery risks posed by human factors and the traditionally hierarchical decision making in large enterprise systems.

Keywords: Risk, Agile, Scrum, Complexity, Shared leadership, Information sharing, Risk management, Large enterprise

Literature Review

Agile Project Management is based on agile values and principles, expressed for the first time in the Agile Manifesto (2001) as follows.

- *Individuals and interactions over processes and tools*
- *Working software over comprehensive documentation*
- *Customer collaboration over contract negotiation*
- *Responding to change over following a plan.*

Agile management methodologies are based on short time horizons (iterations) for planning and review, more flexibility on planning, and more decision-making autonomy given to members.

The most known methodology is Scrum, with the daily standup meeting, called Scrum (in reference to a rugby team), and a timebox for planning and control, called Sprint (Schwaber, 2009).

Agile methodologies have been developed not only to combat some limits of classical command- and-control management, but also to improve adaptability and responsiveness to change (Nguyen & Mohamed, 2020). However, there are still many challenges in making decisions, notably about availability and reliability of information when making more frequent, short-term decisions (Drury-Grogan et al., 2017).

Tavares et al. (2017) explored the way risk management can be implemented in agile contexts. Leung et al. (2008) noted the impact of a more distributed management style on risk management. Do nmez et al. (2018) presented a more precise consideration of uncertainty, distinguishing threats and opportunities.

Marle (2020) provides the following correlation of Agile Project Management (APM) and Project Risk Management (PRM).

Marle mentions that advanced techniques for managing project risk complexity, notably risk inter- dependencies, are coherent with the distributed, self-organized nature of agile teams. This new way of structuring and executing Project Risk Management offers the possibility to make decisions more frequently, when needed, with a more distributed authority, and with richer information about anticipation of events and consequences of actions.

Agile Project Management	Project Risk Management
Sprint planning part 1 (risk network analysis, 2 h)	Risk identification Risk assessment Risk analysis Risk response actions identification
Sprint planning part 2 (risk response plan, 2 h)	Risk response actions assessment Risk response actions analysis Risk response plan decision Risk-oriented reorganization
Scrum meeting (15 minutes)	Risk monitoring and control
Sprint review (1 h)	Risk monitoring and control Lessons learnt
Sprint retrospective (less than 1 h)	Risk management principles (update)

Table 1: Illustration of the correspondence between APM and PRM process steps.
Source: https://doi.org/10.1155/2020/3739129

Thamhain (2013) states "Delayed risk recognition is more difficult and costly to correct than contingencies treated early in their development". To minimize these problems, more collective, team-centered approaches of monitoring the project environment are needed. This will make the project organization more transparent, agile, and alert to changes and issues in the work environment. Further, Senior management has a critical role in conditioning the organizational environment for effective risk management. Many risk factors have their roots outside the project organization, residing in the domain of the broader enterprise system and its environment.

Examples are functional support systems, joint reviews, resource allocations, facility, and skill developments, as well as other organizational components that relate to business strategy, work process, team structure, managerial command and control, technical direction, and overall leadership. All these organizational subsystems have their locus outside the project organization, controlled to a large extent by senior management. In addition, a natural "impedance barrier" seems to exist between the enterprise systems and the project organization, which makes external risks less recognizable and manageable in their early stages. Since early risk detection and mitigation depend to a large degree on the collective multifunctional involvement and collaboration of all stakeholders, it is important for management to foster an organizational environment conducive to effective cross-functional communications and cooperation.

In addition, senior management can unify the project community behind the broader enterprise objectives by clearly articulating business strategy and vision, using a contemporary process that is known as strategic alignment (Shenhar et al., 2007). Taken together, senior management—by their involvement and actions can develop personal relations, mutual trust, respect, and credibility among the various project groups, its support functions, and stakeholders, a critical condition for building an effective partnership among all members of the project community.

This is an ambiance supportive to collective initiatives and outreach and conducive to early risk detection and management.

Thamhain (2013) also notes that people are one of the greatest sources of uncertainty and risk in any project undertaking, but also one of the most important resources for reducing risk. The quality of communications, trust, respect, credibility, minimum conflict, job security, and skill sets, all these factors influence cooperation and the collective ability of identifying, processing, and dealing with risk factors. Many of the conditions that stimulate favorable risk management behavior are enhanced by a professionally stimulating work environment, including strong personal interest in the project, pride, and satisfaction with the work, professional work challenge, accomplishments, and recognition. Other important influences include effective communications among team members and support units across organizational lines; good team spirit, mutual trust, respect, low interpersonal conflict, and opportunities for career development and advancement. All these factors seem to help in building a unified project team that focuses on cross- functional cooperation and desired results. Such a mission-oriented environment is more transparent to emerging risk factors and more likely to have an action-oriented, collaborative nature that can identify and deal with emerging issues early in their development.

Agile project management methods are gaining in popularity in the software industry as software development teams are being asked to be adaptive to market needs, and to react to change and uncertainty (Mishra & Mishra, 2011). Market uncertainty, especially for start-up companies, makes it risky to develop a full product without the opportunity to test a concept (Moogk, 2012). Hislop et al. (2002) explained how software development requires rapid iteration cycles with effective feedback loops that allow for teams to minimize upfront exhaustive collection of customer requirements thus minimizing scope uncertainty. Frequent interaction with project sponsors, face-to-face communication, frequent delivery of useable portions of a product, acceptance to change, and the selection of high caliber teams were also mentioned as common agile techniques (Chow & Cao, 2008; Misra et al., 2009).

In a study to determine what factors and environments aid software development agility in successful projects, Sheffield & Lemétayer (2013) received 106 valid responses from an international survey sent to 452 members from agile communities of practice. They found that organizational culture and the empowerment of the project teams were indicators of project development agility.

Hoda et al. (2013), Gill (2014), and Stettina & Horz (2015) discussed the notion of self- organizing teams,

agility of people, processes, tools, and consideration of a revised culture. Stettina and Horz interviewed 30 participants from 14 European software development organizations and found that agile methods empowered team members to take-on tasks that are traditionally performed by project managers, such as coordinating their own work. They noted that teams had increased interaction, were more stable, and they experienced increased collaboration, transparency, and trust. But no study has been done to understand what this change meant for the role of the project managers and why the project manager role still does not go away. This is an organization paradox that needs to be further researched and root caused.

Serrador and Pinto (2015) collected survey information from 859 people, representing 1,002 projects across multiple industries. They concluded that agile method allows less experienced staff to achieve superior results. They also noted that project complexity was not a significant moderator of agile success. However, there was no supporting evidence provided for this important conclusion.

In the most relevant study so far, Laanti et al. (2011) administered a questionnaire to more than 1,000 respondents in seven different countries to study the agile transformation of a large-scale project within Nokia. Their results listed the benefits of agile methods to include higher employee satisfaction, a feeling of effectiveness, increased quality and transparency, increased autonomy and happiness, and earlier detection of defects.

Surprisingly, the presence of strong executive support and/or sponsor commitment as well as an agile-style work environment were not significant factors for project success according to survey results from studies conducted by Chow and Cao (2008), and Stankovic et al. (2013). However, this contradicts what other researchers have reported about Agile leadership.

Certainly, a firm's leadership team will have an impact on the work atmosphere. Isaksen and Akkermans (2011) performed a survey of 140 participants who played various roles in managing innovation and creativity from 103 different organizations in 31 industries and 10 countries. The data indicated that organizational leaders influenced innovative productivity as well as the employee perception of creativity and innovation via shared leadership.

According to Stray et al. (2016) the sharing of information and the opportunity to discuss and solve problems are contributors to a positive attitude by the team. Also, the use of an information radiator like the Sprint burn-down chart to visualize progress had a positive effect. Factors contributing to a negative attitude were the time taken to provide status reports to the project manager, meeting too frequently and extended Scrum meeting durations. Other issues with the Scrum meeting included an over-reaction to problems by the Scrum master, resulting in team members withholding information about problems, and the reporting of a finished task prior to testing being complete (Moe et al., 2010).

Misra et al. (2009) performed a web-based survey analysis to gather information from 174 eligible responses from practitioners that had transferred from traditional software development practices to agile software development practices. The survey data showed that customer satisfaction, customer collaboration, customer commitment, decision time, corporate culture, control, personal characteristics, societal culture, and training & learning were positively correlated with project success.

The above studies show that a lot has been written about Agile processes and tools but there is very little research done into the risks posed by human factors that contribute to the success or failure of complex Agile projects especially in large enterprises that develop a mix of software and hardware products.

The study results may provide useful insights into factors that impede management and team effectiveness. This will help organizations to design the right incentive programs to mitigate risks to organization agility in large enterprises.

Statement of Research Question

This research study is necessary for enabling the next phase of growth for the Agile project management practices that many industries are asking for. The scale and ambition of the study will need investment in a variety of research tools and knowledge gathering that can only be possible with the funding support of PMI®. PMI® has been working tirelessly towards a unified methodology for project management of systems. The final motivation of this study is to contribute to the PMI Agile Practice Guide and propose a human factors framework for Agile project risk management in large systems companies.

My specific research question is as follows:

RQ1: What risks lead to abandoning agile project management methods in large systems companies? Are there any common failure modes?

Relevance of Study

We critically need an effective Agile Project management technique for management of complex products development that can also address the human dynamics challenges of such projects.

This will require extensive research into the human resource (HR) and organization risks of Agile projects so

we can understand the challenges and find effective solutions for them.

Risk management in complex Agile projects is a challenge because of the large number of interactions between the different components leading to emergent behaviors that are not predictable through any known risk assessment techniques.

Risks originate not just from the product or process complexity but also from human factors in Agile projects. A lot has been researched in the area of tools and processes for managing complex projects using Agile project management techniques but very little work has been done to understand the role human factors play towards Agile methodology success in large enterprises. This study aims to bridge that gap.

Analysis & Conclusions

Process Step/Input	Potential Failure Mode	Potential Failure Effects	SEVERITY (1 - 10)	Potential Causes	OCCURRENCE (1 - 10)	Current Controls	DETECTION (1 - 10)	RPN	Action Recommended	Owner
What is the process step, change or feature under investigation?	In what ways could the step, change or feature go wrong?	What is the impact on the customer if this failure is not prevented or corrected?		What causes the step, change or feature to go wrong? (how could it occur?)		What controls exist that either prevent or detect the failure?			What are the recommended actions for reducing the occurrence of the cause or improving detection?	Who is responsible for making sure the actions are completed?
Sprint execution	Project Managers running Daily Standup and driving status	User stories not completed in Sprint timebox	6	Job insecurity of project managers	6	Sprint retrospective check	3	**108**	Offer other PM opportuities to Project Managers in traditional projects	Director of PMO
Sprint execution	Scrum team members allocated to multiple projects affecting Sprint engagement and velocity	User stories not completed in Sprint timebox	8	Limited resources	8	Resource allocations	4	**256**	Ensure team members are dedicated to a single project at a time with some reserve allocation for field escalations	Director of PMO
Sprint execution	Team members choosing user stories only in their individual area of expertise	User stories not completed in Sprint timebox	5	Individual motivations are stronger	5	Sprint retrospective check	3	**75**	Provide right HR incentives for oursuing team vs. individual goals	VP of Human Resources
Sprint execution	Engineering Managers acting as Scrum Team "Managers" and deciding user story assignments	Low Scrum team morale and productivity	6	Job insecurity of engineering managers	6	Sprint retrospective check	3	**108**	• Offer SME or Product Owner roles to Engineering Managers • Empower Team to make decisions locally	VP of Engineering
Sprint execution	Communication between distributed Scrum teams is weak	User stories not completed in Sprint timebox	6	Time zone and cultural differences	6	Daily Scrum	4	**144**	• Rotate daily scrum time to accommodate the different time zones, • Keep Scrum Team members collocated in one timezone where possible	Scrum Master
Sprint review	Marketing not participating in Sprint demos until the last Sprint	Late Marketing feedback on developed user stories	6	Prefer to give feedback on full product (Waterfall mindset)	6	Sprint Review	4	144	Request VP Product Marketing intervention	VP Product Marketing

Sprint review	Marketing demands major changes after having accepted the userr stories in a previous Sprint	User stories not completed in Sprint timebox	5	Poor Marketing understanding of Agile Scrum process	5	Sprint Planning	4	**100**	Agile Scrum Training	Outside Vendor
Scrum Adoption	Low team participation and belief in Scrum Practices	User stories not completed in Sprint timebox	4	Poor understanding and lack of motivation to learn Agile Scrum process	4	Daily Scrum	4	**64**	• Request executive champion to motivate Agile Scrum adoption • Arrange Agile Scrum Training and make key leaders CSM certified • Demonstrate value with short Scrum pilots	VP of Engineering Scrum Master
Scrum Adoption	Relentless work pace	Team burnout and attrition	5	Ultra aggressive project deadlines	5	Sprint retrospective check	4	**100**	Plan rest periods between specific Sprints	Scrum Master
Scrum Adoption	Constant visibility of progress or lack thereof	Stressed team members	5	Agile process	5	Daily Scrum	5	**125**	Executive champion to make Team see the benefits in this new way of working	VP of Engineering
Scrum Adoption	Frequent change in Scrum team membership	Lower Scrum team velocity due to learning curve for new members	5	Limited resources and attrition	5	Resource allocations	5	**125**	Executive champion to build incentives to motivate stable Scrum Team membership for at least one year	VP of Engineering

Table 2: FMEA analysis of human resource and organization risks in Agile Scrum projects.

Technical & Managerial Considerations

Risks originating from human factors can lead to inter-team friction due to negative attitudes in team members, job insecurity in project and line managers all of which affect the outcome of the Agile projects and often lead to an early abandonment of Agile methodology.

Management must champion the Agile process and empower Scrum teams to fail and constantly learn from their failures for successful delivery of such projects. Sprint retrospective checks are a must at the end of every Sprint as a frequent learning opportunity for the team. Sprint user story demos must happen for every Sprint and must get the full attention of product owner.

The non-prescriptive nature of Agile Scrum methods can often lead to confusion about the best adoption approach in large enterprises where diverse stakeholder perceptions normally prevail. Key leaders must be certified in Agile Scrum process and train the rest of the organization to ensure a common, optimal understanding of the Agile delivery methodology. For instance, Management must design the right incentives to motivate team members to value team work over individual goals, a key factor for Agile delivery success.

A robust development environment that includes near 100% test automation, continuous integration and deployment infrastructure, short build times, frequently refactorable coding practices and friendly pair programming/demos by a Junior and Senior developer will further improve team agility and motivation.

The best risk mitigation approach is an Agile project team that is resilient, experienced in operating under uncertainty and has the risk tolerance and perseverance to achieve its goals amidst so much uncertainty and complexity. But this is only possible with a shared organization leadership that is constantly learning from past failures and willing to improve HR processes.

Leadership must not be limited to Engineering Leaders but also include functional heads in HR, Marketing and C-level sponsors.

The HR action plans listed in Table 2 have to be included in a dynamic risk management plan that continues to be updated throughout the lifecycle of the project as HR risks constantly change in probability and impact.

Ethical, Social & Cultural Considerations

Without a risk seeker attitude, it is very difficult for an organization to achieve innovation so it is important for leadership to take risks but at the same time take measured risks that account for short and long-term or countervailing effects of these risks on ethical, social and cultural fronts. A shared leadership approach will promote trust and information sharing between Management and Scrum Teams. It will avoid the risk of unethical exploitation of workers thru overtime by Team Managers for short-term delivery wins. Members of such autonomous teams will not be afraid to fail first to respond to changing market requirements. Collective decision making by loyal team members will build strong team comradery and resilience in the long run.

This will enable a resilient organization culture that encourages failures and gives workers the power to learn from those failures to meet new market demands. Such a mindset is critical for Agile delivery success in large enterprises.

Any action plans for direct HR risks have to be carefully determined as they may lead to induced risks in the long term for the broader organization and its environment. Care must be taken to not demotivate the non-Agile teams in the organizations that are delivering equally critical products for the business.

Complex Agile projects with high scope uncertainty have multiple failure modes. Enterprises must pause to learn from past Agile delivery failures and avoid the rush to deliver sub-optimal products to market which eventually result in field defects, loss of customer satisfaction, low employee morale & burnout leading to attrition and loss of market share to competitors.

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