

Will Agile Project Management Become the Future of Non-IT Sectors?

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Abstract

The much proven method of agile project management has been primarily considered as a tool for software companies to drive productivity. This paper deals with the driving factors and successful implementation of agile project management in Non-IT sectors. Even though many authors have pointed out the successful implementation of Agile Project Management in IT sector and different dimensions determining the competitiveness and success rates of the project, this paper mainly focuses on the project success in five dimensions. An online survey was conducted and 322 practitioners responded from various industries regarding the success factors of agile project management. The principal component analysis reveals the correlation between the success factors and the project efficiency. Also the challenges faced and the advantages while implementing agile project management methods were also discussed.

Keywords:

Success, Agile project management, Non-IT

1. INTRODUCTION

Project Management demands the quality of an expert juggler. It is a way of juggling the balls simultaneously while maintaining the balance in providing the best quality in stipulated time and reasonable budget. The data from the Ministry of Statistics and Program Implementation (MOSPI) suggest that around 60% of the project failure are because of exceeding the planned time and budget. If these current status are continuing, India will suffer a GDP loss of USD200 billion by the end of year 2018. Proper knowledge of the project management techniques leads to the successful stories in private sector. Projects that failed to complete on time and within the estimated budget leading the country to move away from the track of success. To achieve the projected trajectory of growth of India, a combined effect is needed from Industry, government, professionals and academic bodies.

Recently the MOSPI has brought to light some data on time and finance overdo in public sector projects. The delays and improper establishment of public sector infrastructure projects like roadways, rails, and power projects resulted in exceeding budget of Rs.1.24 lakh crore (USD19.07 million). Among the 600 projects of over Rs.150 crore (USD 23.31 million), 73 projects started without getting the approval on completion dates and 203 projects are of cost overruns, and 306 of time overruns. These 306 delayed projects also caused cost overrun of 23 percent. Around 50 percent of projects were unable to complete on the stipulated time and 33 percent of government initiated projects suffered a cost overrun. Lack of proper management of projects causing a bane for India's dreams to be an economic powerhouse. (Source:<https://www.pmi.org.in/manageindia/volume3/issue04/manage.india.pdf>)

According to MOSPI's detailed study, the factors shows in Table 1 are withholding the normal project progress.

Factors affecting Projects	Number of projects
Fund constraints	31
Land acquisition issues	22
Slow progress in areas other than civil works	79
Law and order matters	10
Delay in equipment supply	5
Environmental clearance	2
Others	48

Table 1: Factors affecting projects (Source: Project Management Practices in India 2010 (Indicus Analytics and Ace Global); Project Implementation Report (MOSPI))

Delhi Metro project can be considered as the successful implementation of project management in public sector. Delhi Metro is the fast track system that joins Delhi with other towns. It is a joint venture between Government of India and Government of Delhi and operating by Delhi Metro Rail Corporation Ltd (DMRC). Delhi Metro is the world's 12th largest metro system in terms of both length (213 kilometers (132 mi)) and number of stations (160) including 6 on Airport Express line. (Source: Delhi Metro about Us Introduction". DMRC; source: <http://www.dailypioneer.com/sunday-edition/sunday-pioneer/landmark/delhi-metro-to-be-7th-largest-in-world-by-2016.html>).

Delhi Metro project is the benchmark of Urban Planners as a successful public sector project. The Delhi Metro Rail Corporation has been certified by the United Nations as the first metro rail and rail-based system in the world to get "carbon credits for reducing greenhouse gas emissions" and helping in reducing pollution levels in the city by 630,000 tones (630000000 Kg) every year. (Source: Delhi Metro gets UN certification. The Hindu, 26 September 2011). The planning phase of Delhi Metro project started in 1984. The initial step was the setting up of the Delhi Metro Rail Corporation (DMRC) which was done in 1985. By 1998 the constructions were initiated. First section of phase I was opened in 2002. The total cost for phase I was USD 2.3 billion which was within the budget.

The main reasons for its success were trained and experienced project managers, whole recruitment process done by management, tenders quotes, approvals and fund utilization that reduced delays, detailed planning and proper budget estimation and including stakeholders from the project planning phase. Some failure records have forced various researchers and project engineers and practitioners to look into some other efficient error proof or failure proof method of project management by altering the traditional methods in order to face specific challenges during project management. This all led to the more weightless concept of Agile Project management. (Serrador and Jeffrey, 2015). The main concepts of agile starts with less initial planning and design and further an incremental and iterative approach of continuous project improvement. Agile completely eliminates the traditional approach which relies mainly on an early design and pre fixing of specification, a preplanned scope, and no customer involvement with flexible project scope, uncertainty inclusions and at large customer interactions.

The traditional method of project development utilizes logical sequencing according to which the resources and deliverables are preset. The project will be assessed on the basis of different reviews and evaluation techniques upon the performance (Collyer et al., 2010). Since agile techniques are famous for the process development projects (Dyba and Dingsoyr, 2008), no in-depth research has been found out determining the success rates of agile projects. Most of the research on agile are taking small-sample case into consideration. Also the study areas are limited by industry or geography.

In the IT sector, agile project management is well-known for proper planning and executing projects. But there is no quantitative study regarding the success rate and efficiency of the project in non-IT sector. This paper deals with the successful Agile implemented projects in non-software companies and their success rate. Investigation of Agile in various aspects of successful completion of projects, comprising different sectors was done to evaluate the magnitude to which agile can be directly related to project success factors, its flexibility with different project circumstances.

2. LITERATURE REVIEW

According to Project Management Institute, project management methodology is considered as a combination of methods, techniques, procedures, rules, templates, and best practices used on a project. (Project Management Institute, 2008). A proper plan, proper execution and control process, change in customer requirements and technology are the major concerns related to traditional project management. Also improper risk management and changing customer requirements while implementing project are also affected the successful implementation of traditional project management methodologies. To avoid these kinds of drawbacks of traditional project management, agile project management methodologies are started implementing by different industries. (Leybourne, 2009).

The success of agile in software development project increases its demand in the software industry. While scaling it to large organizations, the critical challenges faced by managers comes under three areas - process conflicts, business process conflicts, and people conflicts (Boehm and Turner, 2005).

Initially agile methods were developed for small scale teams. While launching it to high scale, proper integration and coordination with other departments also are necessary. The most uttered challenge categories are the most strenuous ones to implement, amalgamating the back holding processes, conservative, and requirements challenges in engineering. The elements contributing to the success are the ones that received the most references are choosing and altering the agile method, management support, mind- set and alignment, and andragogy. (Dikert et al., 2016).

The failure of the projects in the Czech companies pointing out four factors, Organizational, human factors, business process and technology (Antlova, 2014). The fortunately finished projects show the need for the customer collaboration, flexibility and the proper customer care requirements that are need to be met.

Agility has the unique characteristics of breakdown of work in short, rechecking the finished tasks, customer involvement from the planning phase and the team collaboration. One of the most distinctive agile methods is Scrum process, which involves dispersing large and multiplex projects. After the correct dispersal into easy mini units, the priority of each task is set (source: www.agilemanifesto.org).

Proper communication between project team and that with the customer is made possible only the organization's corporate culture. It is also mandatory that project team members were timely updated with recent developments in project management. While considering the agile approach, frequent customer or user interactions require effort and can be side paved as arduous. These problems could be solved by using of information and communication technologies. (Antlova, 2014).

Bermejo et al. (2014) proposed that firms having the highest winning rates in software are similar to those which have greater team strength, culture, client collaboration and interaction with all the stakeholders. Firms that enacted agile software development strategies achieved triumph in software development, but agile principles are not only the factor that guarantees project success. Additionally, relationships with external partners was found to be a governing element for success and, hence, of high importance to the agile software development domain.

Inayat and Salim (2015) identified seven challenges of Agile Requirements Engineering poses to project organizations include reducing documentation, estimation of budget and schedule, improper architecture, neglecting the idle requirements, waste management, customer unavailability and contractual issues. In order to sort out the budget and time estimation constraint, recurrent communication and story prioritization are found to be required.

Brhel et al. (2015) proposed to combination of the merits of two major approaches in software development: Agile software development, which aims to perceive high rate of accessibility and to achieve pliability during the development process, and user-focused design, which ensures the end results and the user requirements at the center of software development in order to provide the software with required and designated usability. They record the current state of ASD and UCD integration and notes generic principles that make up an integrated User Centered Agile Software Development (UCASD) approach. The five principles of UCASD are unique discovery of product and product creation, incremental design and development, parallel interwoven creation tracks, proper stakeholder involvement and communication with the clients.

Chakravorty and Chakraborty (2014) focused on IT projects linked with manufacturing sector by finding out the importance of various agile project testing attributes to market their product across various phase of information systems development life cycle (SDLC). The various traits include prioritization of specifications as per customer requirement, customer participation in planning phase, incremental and iterative methods, flexibility with less documentation and complexity management.

The success attributes of project management have been implemented via the golden triangle, but the relation between project iteration factors and critical decisions is unknown. Agile teams discussed four categories of iteration objectives: Functionality, Schedule, Quality and Team Satisfaction. Two of these objectives lead directly to two facts of the golden triangle: schedule and quality. The agile teams' critical decisions were verified to understand the different decisions made by the teams to ensure success, which resulted in four categories of such decisions: quality, team work, iteration objectives and team satisfaction (Drury-Grogan, 2014). Requirements & specifications (beginning of the project), project scheduling (planning phase), team work and the client collaboration (Stare, 2014) are the main advantages of agile approach over the traditional approach.

Recently agile became popular among the practitioners over the traditional methods since it supports in developing software in changing environments and requirements with low cost and high quality. The data from Indian software companies reveals that agile is having an upper hand over traditional methods in software development (Sruthy et al., 2016).

It is important to recognize that the agile approach concentrates initially on the project execution phase and does not elaborate the whole project life cycle, which in principle is similar (initiating, planning, executing and closing), rather than the final stage of the initiation (definition of specifications) and portions of the planning are taken to the execution phase (Stare, 2014). The accuracy of the planning phase can be affected due to this method– it is necessary to define a vague schedule for whole project at the beginning, while discrete iterations are planned in detail in the project implementation phase (e.g. tactics, tasks, hours of work, performers).

Extreme project management is an upgraded version of agile (offering a higher level of agility). According to Thomsett (2002), the latter is more flexible and is grounded on the dynamic needs, development cycles, virtual teams, changing technologies and the collaborative participation of all the project stakeholders. He emphasizes that partnership is the key factor contributing to the client (user) and the contractor (project team) relationship. Wysocki (2009) points out that the variations in approach results from the range of acquaintanceship with the solution at the project's initial stage. The main differences are the way of planning, the greater role of risk management, and more mingling with the client.

The only known research on agile product development was made by Berger & Beynon-Davies (2009). Using the iterative development principles, they demonstrated several issues with the application of, particularly considering the conduct of stakeholder participation within joint design. In general, initially the stakeholders were reluctant in their involvement and, even though formally empowered, stayed stubborn in decision making outside their expected positions. Conveyance within design sessions was also sparse rather than open. Such difficulties in turn impacted the project's course causing unwanted retards in complying with key project deadlines.

The studies over past two decades reveal the success of agile project management in software companies. This paper is mainly focusing on the success stories of non-IT companies and the factors affecting their project success. Also the challenges faced while implementing agile methods and the advantages of agile approaches are also discussed.

3. METHODOLOGY

An online survey conducted using google forms and posted it in LinkedIn project management groups. Also data collected from different practitioners who are members of project management related groups in LinkedIn.

4. SURVEY RESULTS

An online survey conducted using google forms and 322 practitioners from various industries responded to it. The largest percentage of respondents were from (shown in fig 1) software and IT services (37%) and manufacturing (26%) and the rest includes consulting (18%), telecommunications (7%), hospitality (5%), oil and gas (4%) and others (3%). The different practitioners as shown in fig 2 include: Project Manager (26%), Software developers (22%), Project Coordinator (15%), Quality analyst (14%), Program Manager (6%), Business lead (6%) and others.

According to the survey results, fig 3 explains the challenges most of the companies facing while implementing agile project management. The important challenges they are facing are Budget and schedule estimation (30.5%), Minimal documentation (24.9%), Waste management (18.2%), Contractual issues (10.3%), Neglect of non-functional requirements (9.3%) and Customer unavailability (4.2%).

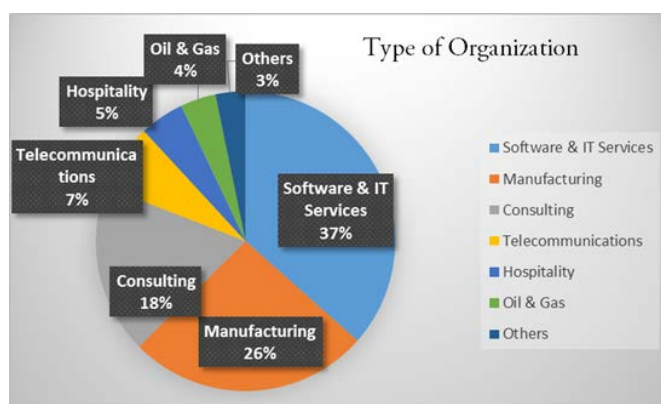


Fig 1: Type of organization

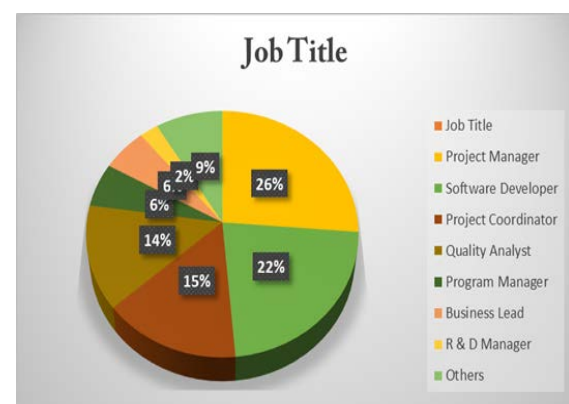


Fig 2: Job title

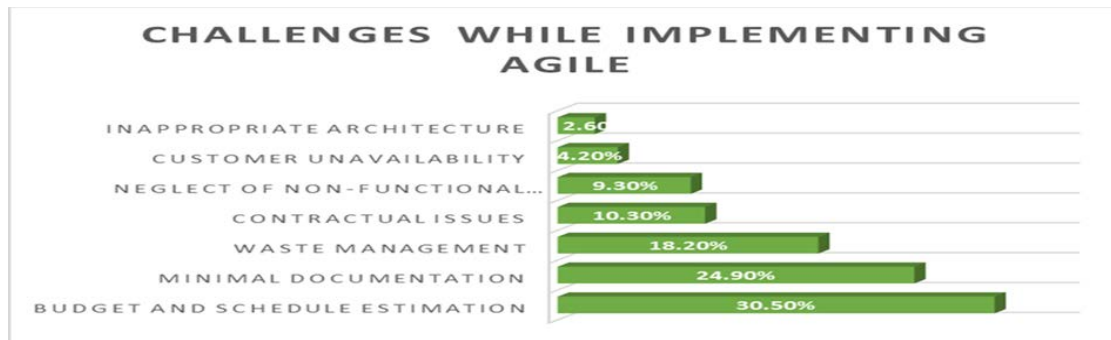


Fig 3: Challenges faced while implementing agile

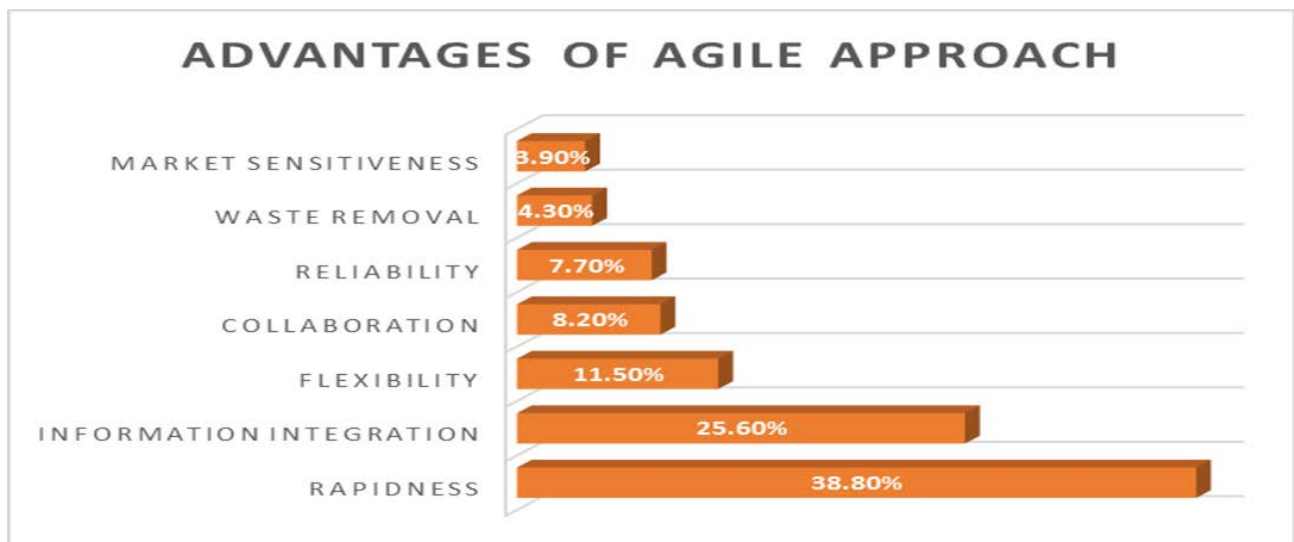


Fig 4: Advantages of agile approach

As shown in the fig 4, the main advantages of implementing agile project management techniques are Rapidness (38.8%), Information integration (25.6%), Flexibility (11.5%), Collaboration with the stakeholders (8.2%), Reliability (7.7%) and Waste removal (4.3%).

Success factors





Fig 5: Success factors

The success factor of each project is analyzed according to four different dimensions of project success. Practitioners responded to each success factors by rating it from unsuccessful to very highly successful. Fig 5 represents the four different dimensions of project success, meeting project budget goals, meeting scope and requirements goals, achieving client's satisfaction and achieving end user satisfaction. For meeting project budget goals, 46.1% of the projects are moderately successful and 25.2% are highly successful. Around 36% projects are moderately successful in meeting scope and requirements goal and around 32% projects are highly successful. Considering the satisfaction factor, 45.6% are highly successful in achieving client's satisfaction and 43.2% are highly successful in achieving end user's satisfaction.



Fig 6: Overall Project Success

The overall project success is also found out by rating it on 5-point scale. Fig 6 represents the overall project success in a scale of unsuccessful to very highly successful. Around 39% projects are found to be highly successful and 35.9% projects are moderately successful and 11% projects are less successful.

5. ANALYSIS

Principal Component Analysis is used for analysis in order to find out the correlation between the variables used from the literature review.

The communalities represented in Table 2 are computations which a variable is explained by the components. Risk management has the lowest communality value, which represents that it is not much

explained by the analysis like any other factors (more number of factors increases the communality of all the variables).

	Initial	Extraction
Project scheduling	1	0.963
Teamwork	1	0.888
Client collaboration	1	0.92
Requirements and specifications	1	0.829
Changing Technologies	1	0.93
Participation of Stakeholders	1	0.955
Risk Management	1	0.807

Table 2 : Communalities

Component	Initial Eigenvalues		Extraction Sums of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.823	54.614	54.614	3.823	54.614	54.614
2	1.403	20.036	74.649	1.403	20.036	74.649
3	1.066	15.226	89.876	1.066	15.226	89.876
4	0.322	4.6	94.476			
5	0.206	2.945	97.421			
6	0.129	1.841	99.262			
7	0.052	0.738	100			

Table 3: Total Variance Explained

The three rightmost columns of the total variance in Table 3 explained contain the most important information and it is interpreted as: Project scheduling, team work and client collaboration have been saved from the analysis of seven components. These three factors explains 89% variation in the data. That is, 89% of information in all seven variables can be predicted using these three factors. Project scheduling explains more of the variance than other two factors.

	Component		
	1	2	3
Project scheduling	0.588	-0.594	-0.514
Teamwork	0.718	0.593	0.146
Client collaboration	0.689	0.518	0.42
Requirements and specifications	0.903	0.057	0.104
Changing Technologies	0.779	-0.524	-0.22
Participation of Stakeholders	0.624	0.26	-0.705
Risk Management	0.822	-0.291	-0.218

Table 4: Component Matrix

Table 4 represents the component matrix. The first principal component is strongly correlated with all the original variables. It increases with increasing project scheduling, teamwork, client collaboration, requirements and specifications, changing technologies, participation of stakeholders and risk management. First component seems to measure the efficiency of the project.

The second principal component is correlated with only four of the original variables. Even though the project is having a proper team and client collaboration, the improper technology will affect the project scheduling.

The third principal component is also correlated with only two variables. It represents if proper participation of stakeholders are not involved, it will affect the project scheduling. It represents the stakeholder satisfaction.

	Initial	Extraction
Project budget goals	1	0.858
Scope and Requirements	1	0.761
Client satisfaction	1	0.896
End-user satisfaction	1	0.539
Overall project success	1	0.966

Table 5: Communalities of success factors

The communalities of success factors are illustrated in Table 5.

Component	Initial Eigenvalues		Extraction Sums of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.087	41.75	41.75	2.087	41.75	41.75
2	1.933	38.669	80.418	1.933	38.669	80.418
3	0.812	16.245	96.663			
4	0.167	3.337	100			
5	1.63E-15	3.25E-14	100			

Table 6: Total variance explained for success factors

As shown in Table 7, achieving end user satisfaction has the lowest communality, which indicates that it is less well explained by the analysis than any of the other factors. Meeting project budget goals and scope and requirements explains 80% variation in the data.

	Component	
	PCA1	PCA2
Meeting project budget goals	0.843	-0.385
Meeting scope and requirements	0.53	-0.293
Achieving client satisfaction	0.461	0.827
Achieving end-user satisfaction	0.051	0.732
Overall project success	9.39E-01	2.91E-01

Table 7: Component matrix for success factor

Table 7 shows the component matrix for success factors. The first principal component is strongly correlated with three of the original variables. Meeting project budget goals and scope and requirements will result in the overall project success. It represents the overall efficiency of the project. The second principal component is correlated with mainly with only two of the original variables. Achieving client's satisfaction will lead to end user's satisfaction. This represents the stakeholder satisfaction.

6. LIMITATIONS AND FURTHER SCOPE OF RESEARCH

A limitation of this research is an evaluation of the percentage of agile used in each project and its effect on the project success. Future research should verify this relationship and find out the correlation. Also agile project management techniques are not widely implemented in consulting firms. So the reason for rejecting or not implementing agile methods can be found out in the future research. Future research can include the importance of hybrid agile methods, a combination of agile and traditional project management methods. That is mainly focusing on the companies using hybrid agile methods and the factors determining the success. This research doesn't include the different planning methods in agile approach. So future research can include how structured planning impacts the agile success.

7. CONCLUSION

From a past few years, agile has been replacing the traditional methods for project planning and execution mainly due to the success rate in IT industries. This paper has explored the efficiency and success rate of Agile project management in Non-IT sectors and shows a quantitative analysis of different success factors. Our findings reveal that the range of Agile used in a project does have a statistically significant impact on all five dimensions of project success, meeting project budget goals, scopes and requirements, client satisfaction, end user satisfaction and overall project success. The main challenges the organization faced while implementing agile project management techniques are in budget and schedule estimation, for minimal documentation, waste management and contractual issues. The main advantages of agile approach are rapidness, information integration, flexibility and collaboration. From the survey conducted, around 82% of the total respondents revealed that they are aware of the agile project management methods used in the organization. Other respondents from consulting firms are unaware of the agile methods and also some employees in the lower level management of the companies implementing agile are unaware of agile methods. For proper implementation of agile, communication with all the stakeholders is needed, since it is lacking in most of the firms.

REFERENCES

- Antlova, Klara (2014). Agile Approach in the Project Management of the Czech Companies. *Procedia Technology, Volume 16, Pages 929-933*.
- Berger, H., Beynon-Davies, P. (2009). The utility of rapid application development in large-scale, complex projects. *Information Systems Journal. 19 (6), 549-570*.
- Bermejo Paulo Henrique de Souza, Zambalde André Luiz, Tonelli Adriano Olímpio, Souza Samara Alyne, Zuppo Larissa Avelino, Rosa Priscila Luiz (2014). Agile Principles and Achievement of Success in Software Development: A Quantitative Study in Brazilian Organizations. *Procedia Technology, Volume 16, Pages 718-727*.
- Boehm Barry, Turner Richard (2005). Management Challenges to Implementing Agile Processes in Traditional Development Organizations. *IEEE Software. Vol. 22 Issue 5, p30-39*
- Brhel Manuel, Meth Hendrik, Maedche Alexander, Werder Karl (2015). Exploring principles of user-centered agile software development: A literature review. *Information and Software Technology, Volume 61, Pages 163-181*.
- Chakravorty Tulika, Chakraborty Samyadip, Jigeesh Nasina (2014). Analysis of Agile Testing Attributes

- for Faster Time to Market: Context of Manufacturing Sector Related IT Projects. *Procedia Economics and Finance, Volume 11, Pages 536-552.*
- Collyer, S., Warren, C., Hemsley, B., Stevens, C., (2010). Aim, fire, aim — project planning styles in dynamic environments. *Proj. Manag. J. 41 (4), 108–121.*
- Dikert Kim, Paasivaara Mariaa, Lassenius Casper (2016). Challenges and success factors for large-scale agile transformations: A systematic literature review. *Journal of Systems and Software, Volume 119, Pages 87-108.*
- Drury-Grogan Meghann L. (2014). Performance on agile teams: Relating iteration objectives and critical decisions to project management success factors. *Information and Software Technology, Volume 56, Issue 5, Pages 506-515.*
- Dybå, T., Dingsøyr, T., (2008). Empirical studies of agile software development: a systematic review. *Inf. Softw. Technol. 50 (9), 833–859.*
- Inayat Irum, Salim Siti Salwah, Marczak Sabrina, Daneva Maya, Shamshirband Shahaboddin, (2015). A systematic literature review on agile requirements engineering practices and challenges. *Computers in Human Behavior, Volume 51, Part B, Pages 915-929.*
- Leybourne, S. A. (2009) Improvisation and agile project management: a comparative consideration, *International Journal of Managing Projects in Business 2, 519-535.*
- Project Management Institute, (Ed.) (2008) A guide to the project management body of knowledge, 4th edition.
- Serrador Pedro, Jeffrey Pinto (2015). Does Agile work? — A quantitative analysis of agile project success; K. *International Journal of Project Management. Vol. 33 Issue 5, p1040-1051.*
- Sruthy M. K., Surya, M., and Krishnan M., S (2016). Influence of agile on Indian IT companies. *International Journal of Control Theory and Applications, vol. 9, pp. 6659-6666.*
- Stare Aljaž (2014). Agile Project Management in Product Development Projects. *Procedia - Social and Behavioral Sciences, Volume 119, 19 March 2014, Pages 295-304.*
- Thomsett, R. (2002). Radical project management.. *Upper Saddle River (NJ): Prentice Hall PTR.*
- Wysocki, R. K. (2009). Effective project management: traditional, agile, extreme. (5th ed.) *Indianapolis: Wiley Publishing.*

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