



Hybrid Model Using Scrum Methodology for Software Development System

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Abstract

Because since the mid-1990s, traditional project management techniques have been progressively being phased out and replaced with lightning experimental tools. This issue is mostly caused by the inadequacies of traditional techniques, which include a sluggish response time to positively influence business needs as well as a proclivity to go over expenditure and be late to a project's deadline. Both traditional and agile techniques are discussed in detail in this article, along with their features, strengths, and shortcomings. In addition, the four main stages and nine specialties of the unified method, as well as the common components of the Scrum process, are explained in this article. The article concludes with the suggestion of a new hybrid agile methodology that blends the analytical hierarchy processes with the Scope statement to make use of the advantages of both methodologies while simultaneously suppressing their shortcomings. The hybrid approach may be used in the technology industry, and in particular in economic sectors that facilitate the exchange projects, to great effect.

Keywords: Hybrid project management method; Initial concentration; Scrum process; Traditional project management techniques; Agile development methods; Integrated framework

Introduction

Substantial, document-driven application development techniques are characterized by substantial preparation, defined processes, disciplined reuse, comprehensive documenting, and significant design upfront [1-4]. Till the mid traditional techniques were also the dominant way of development in the computer business. Since then, traditional software development techniques have been mostly supplanted by ultralight software development approaches, which are used mainly in small-scale and very basic projects. Most of the blame for this phenomenon may be attributed to the inadequacies of traditional techniques, which include a propensity to be way over budget and behind time [5-9,10-13], as well as sluggish adaptability to constantly changing business needs. As previously stated, traditional techniques have likewise failed to provide significant improvements in productivity, dependability, and simplicity [14].

The regulations of some projects were reported to have changed by as much as 25% or more during the enterprise world [15]. According to Sridharan et al.; Vemuri et al.; Arunkarthikeyan et al.; Kruchten; Lindvall et al.; Lippert et al.; and Miller et al. [16-22] a fascinating study, methodologies were not originally activated in response to requirements changes that occur in the central portion of a system design, and that a technology product's desire to take suitable treatment in response to changes often determines its strength or weakness. Many projects were undertaken with fewer customizations than those recommended in the system architecture, along with a report by the Standish group [23], using standard means in a variety of industries and governmental agencies. Because of the constant technological advances and business environments, it is also a challenging task for traditional treatments to make a proper number of needs upfront. However, despite their inherent shortcomings, current approaches continue to be widely employed in the industrial sector, consisting of multiple projects. The simplicity, disciplined, and formulated nature of traditional means and also some of their ability which provides predictive power, stability, and high assurance are the driving forces behind their widespread application. Through the use of light and the rising population life cycle, agile development methods emphasize agile project development, strategic approach, easy to customize, and frequent release. There are numerous advantages to adopting an agile development approach. Several studies have found that short processing cycles, higher quality products, lower vulnerability rates, and faster reinterpretation to constantly developing customer needs are all possible [24]. Although agile methods have the potential to provide significant benefits, many organizations are hesitant to abandon their traditional methods in favor of concurrent engineering due to a variety of concerns and concerns. These are some examples: Among the limitations of agile methods are the following: 1) They appreciably lower the number of record-keeping and largely depend on intangible assets; 2) they have not been well enough tested for expedition projects; 3) They are insufficient for relatively efficient projects; 4) They can only be able to succeed with brilliant people who prefer much flexibility, and 5) They are insufficient for highly volatile projects. The character traits, qualities, and weak points of the traditional and researchers seem to agree are summarised in Table 1, which can be found below. There are advantages and disadvantages to both approaches, as indicated in the table below. Developing a new technique that incorporates the advantages of both approaches while simultaneously suppressing their disadvantages would be very helpful to everyone involved. According to this article, a new technique is proposed that blends the Analytical Hierarchy Process (a traditional method) with Agility (an innovative way) to capitalize on the advantages of both methods. The following is the structure of the following paragraphs: The features of the Analytic Network Method and the effective way of the agility process are discussed in detail in the following two sections. Following that, a newly designed model/method is introduced, along with an explanation of how the Analytical Hierarchy Process is integrated with the Scrum framework. Finally, the author ends the article by making suggestions for further research that may be pursued.

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Table 1: Comparative analysis among traditional and suitable framework (Agile).

	Conventional Methods	Agile Methods
Characteristics	Extensive planning	Iterative and incremental development
	Codified process	Customer collaboration
	Rigorous reuse	Frequent delivery
	Heavy documentation	Light and fast development cycle
	Big design up front	Tacit knowledge within a team
		Light documentation
Strengths	Straightforward, methodical, and structured nature	Short development cycle
	Predictability, stability and high assurance	High customer satisfaction
		Low bug rate
Weakness	A slow adaptation to rapidly changing business requirements	Significant document reduction and heavy dependence on tacit knowledge
	A tendency to be over budget	Not sufficiently tested for mission/safety-critical projects
	A tendency to be behind schedule	Not adequate for highly stable projects
	Difficult to create a complete set of requirements up front	Can be successful only with talented individuals who favor many degrees of freedom
		Not appropriate for large-scale projects

The Integrated Logical Process

It was created and it is a well-defined element process improvement method that was initially provided by IBM Adobe Systems and then adopted by other vendors [25-30]. According to good analytical techniques the UP adopts progressive, eligibility criteria, and analyzes different problem-solving. Universal principles (UP) include the following: 1) Customize the workflow, 2) Integrate stakeholders' demands, 3) Cooperate beyond teams, 4) Show value incrementally, 5) Raise the levels of sophistication (and 6) Keep quality in mind at all times. There has been a long and successful history of the UP, and it has developed. The evolution of the UP is shown in Table 2 via several

Table 2: Title compounds overview.

Year	Event
1988	Objectory v1.0 is created by Jacobson's objectory AB company. Rational unified process and enterprise unified process came out from the objectory process
1996	Rational Objectory Process (ROP) 4.0 is created. Iterative concept is introduced.
1998	ROP is renamed into rational unified process and RUP 5.0 is released
1999	Rational Unified process 5.5 is released with an enhancement of real-time and web-based development

2000	Rational unified process 2000 is developed with the addition of business engineering techniques to the business modeling discipline to the business modeling discipline and a more enhanced requirements approach
2003	Rational unified process 2003 is released with an enhanced test discipline
2004	Enterprise Unified process is developed with the expansion of the enterprise management discipline
2005	Agile unified process is developed

variants. The Rational Unified Processes (RUP) 2003 was chosen as the framework for this research from among the other various versions available. As indicated, RUP originated from the Results are well-documented process v1.0 and developed into RUP 2003, which included several improvements and modifications throughout the years. An agile software development process known as the Agile Unified Process (AUP) has recently been created as a lighter version of the Unified Process (UP). The AUP employs a compressed strategy, which includes fewer work packages, as well as a simpler manner of implementation. RUP has a two-dimensional framework, consisting of cycles and specializations. Throughout a project's lifecycle, the phases reflect the three distinct stages that it goes through. Concept, interpretation, implementation, and changeover are the four main phases of a project. The professions are the logical processes that occur during the project's duration. Generally, specialties are split into two categories: primary disciplines and supporting disciplines. Organizational modeling, facilitated by the fact, testing and debugging, implementation, testing, and implementation is the primary disciplines involved. Specification and environment framework, systems engineering, and surroundings are just a few of the assistance categories available. The two aspects of RUP are shown in Table 3. The

Table 3: 2D (two dimensional) –RUP.

Dimensions		RUP
Phases		Inception
		Elaboration
		Construction
		Transition
Disciplines	Main disciplines	Business modeling
		Requirements
		Analysis and design
		Implement
		Testing
		Deployment
	Support disciplines	Configuration and change management
		Project management
		Environment

9 domains may be used in conjunction with one another throughout two or more stages of the RUP project lifecycle. Examples include the use of the business modeling field of study for both the acquisition and clarification phases to gain an understanding of the industry, the requirement analysis discipline in any four processes, and indeed the design, operationalization, and testing academic subjects in all four different phases to characterize specifications that the system must incorporate, design a solution for something like the system which thus complies with the requirements, and write test cases for the system. When the distribution discipline is implemented, it may occur

throughout the formulation, building, and changeover phases, and it can be used to bring a part of the system or the whole system online for users. The support professions may be used during all four stages of the project’s planning and management. Using the four stages as a guide, Table 4 illustrates where the nine specialties are employed, or where the specialties were being used the most often.

Table 4: Use of RUP stages of specialties.

RUP disciplines	Phases
Business Modeling	Inception*, elaboration
Requirements	Inception, elaboration*, construction, transition
Analysis & Design	Inception, elaboration*, construction, transition
Implement	Inception, elaboration, construction*, transition
Testing	Elaboration, construction*, transition
Deployment	Elaboration, construction, transition*
Configuration & change management	Inception, elaboration, construction*, transition
Project management	Inception, elaboration*, construction, transition
Environment	Inception, elaboration*, construction, transition

Synthesis is the First Stage of the Process

1) Characterize the marketing strategy of the proposed format and the project, 2) Build preparatory financial and operational approximations based on stakeholder approval, 3) Recognize the entrepreneurial need for the project, 4) Acquire the knowledge by the project’s business case, and 5) Maintain a workable alternative vision. As demonstrated the profession of process models is heavily used during the genesis period of a company. Business modeling discipline exercises during this phase include: 1) Developing a range of business rewards, system strategic goals, and requirements applicable; 2) Describing the problem or requirement; 3) Considering business process in the future, as well as interfaces to other systems; and 4) Analyzing the different channel stockholders, current structure design, and system parameters.

The Elucidation Phase is where the Magic Happens

The conceptualization phase is characterized by the gathering of complete information, which is why the specifications discipline is heavily used during this process. Based on the information collected, binary and multi needs are identified and documented. It is the actions and procedures that the news system should do that are described in the requirement specification. Those non-functional criteria relate to features of the new system rather than specific tasks or activities that the system must carry out. Non-functional requirements may include things like performance aspects, performance criteria, accessibility requirements, maintainability, and access controls, to name a few examples. All stated needs are prioritized and reviewed with real system users to determine which are the most important. An organized walkthrough with users is a crucial step in ensuring that the requirements that have been collected and prioritized are accurate and suitable for the project. During this phase, it is also possible to create user interface dialogues.

The Primary Phase Construction

Computing and advanced applications are the primary objectives of this phase. Throughout the inception steps, all of the process tools and features were developed and produced and according to specific requirements. This includes operating systems, presentation layer,

network management functions, and improve the situation functions. If the system is complete and ready to be released, the technique can be implemented during the next stage of development. There may be several iterations during this phase, which will allow the system’s planning and execution to proceed. A lot of important iterations, particularly for large projects, may be required to overcome the project down into smaller, more manageable sections.

Secondary Phase Transition

Throughout that stage, you will be transitioning from one stage to another. This phase involves the delivery of a system into development and the continuity of service to process transactions. One or more different versions in this phase may include individual consumer training using a user’s guidebook, verification, and validation to ensure that the system functions as expected by the end-users, and corresponding reconfiguration and fine-tuning as necessary. The implementation cycle is considered complete when all tasks have been completed.

Struggle with the Scope Statement

Here, we will provide a brief overview of the Scope statement, which was among the most widely used agile methodologies. We will also cover the most common key components. Based on the statement provided by Schwaber [26, 27, 28], who was responsible for developing the first version of something like the Scrum development cycle, the following description has been developed. It is possible to trace the existence of the term scrum back to a popular sporting activity known as rugby, that the teams of fifteen individuals face against one another. In rugby, the term scrum describes the method that is used to bring a loose ball back into play. Since 1986, however, it has been used to define a process of developing products The Scrum framework has evolved since then to organize development teams around a holistic movement, similar to that of a rugby game, continuous conversation within and between team members, and a core collection of people who remain constant. The Scrum Master (SM) is a member of a team who organizes the daily Scrum meeting and location, attempts to remove any production impediments, and acts as a liaison between the Project team and other departments within the organization. The scrum master also monitors the daily Scrum meetings to determine the team’s progress and determine its overall velocity.

When working with Scrum, there’s a whole number of essential appointments to attend. These gatherings include the daily serial, the daily scrum of penalty kicks meetings, the Team meeting review, and the Serial performance review. It is a brief (often 5-15 minutes) upfront conversation in which engineers discuss what has been accomplished since the last consultation and what will be accomplished before another conference, as well as any roadblocks they may be encountering. Each developer team may have a different timetable for the project Status meeting, depending on their needs. The regular Scrum of Handballs is a daily gathering for Product owners from various Organizational units that takes place daily. Please keep in mind that both problems encountered are intended to be a brief standup session.

Along with casual regular meetings, two additional structured month groups are usually held every month. Every month, group members gather to split a few of the items on their project deliverables into a series of tiny and achievable tasks, which are then added to the Risk register. Its project schedule is a prioritized list of all customer needs defined by the development team and maintained by the software architect. The Requirement specification is constructed in such

a manner that all tasks may be finished within a couple of months regarding the future execution time for each job. As tiny tasks are accomplished, professionals can readily observe the progress made and may feel a feeling of success at each Scrum meeting, which helps them to feel more productive. Another weekly meeting, the Beginning of each sprint meeting, has as its primary goal the evaluation of what might be accomplished, what needs a complete overhaul, and also what the team has played well. Traditionally, a Sprint testing process is accompanied by a Planning phase, which takes place over a day.

The composition of each team has a significant impact on the effectiveness of project management using Scrum techniques. In specifically, the Scrum approach empowers professionals to manage their teams and have a greater sense of responsibility for the projects on which they are engaged. A common point of agreement among scientists is that the organization should make decisions on how to proceed based on its collective wisdom and that the team should have more influence over how the work is handled and finished. Overall, Scrum allows tasks to be completed more effectively as a team and communicate more effectively, resulting in increased outcomes [31]. The development process and the Project schedule are used to strengthen the relationship in prioritizing work from the viewpoint of effective corporate communications. To establish a track of assigned tasks, a Sprint backlog chart that displays actual performance is utilized [32]. Project priorities and task allocations to development are modified frequently in Scrum depending on former players' progress on their work and business needs. Scrum's incremental and continuous auditing of construction progress would be another distinguishing feature. Each project Status discussion and Scrum team events assist employees in constantly and constantly monitoring project status. Scrum Master Meetings, especially now that there are increased tasks, assist developers to remain on track and remind them of what has to be done frequently.

Process of Hatchback Computer Programming

Teaching approaches have primarily been used in moderately straightforward projects, as mentioned in the introduction section, and have not been adequately tested in construction organizations, though researchers have observed that huge and complex projects stood to benefit from delightfully tailored agile project management. One answer to this problem is to combine the Scrum and RUP methods to develop a new hybrid approach. Scrum and RUP were chosen because Scrum is appropriate for construction managers and RUP is very simple to streamline. A proposed hybrid model is shown in Figure 1. The four main stages and specializations, which are shown

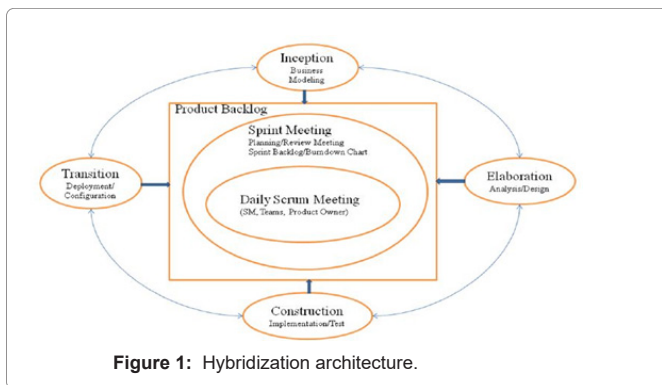


Figure 1: Hybridization architecture.

in Figure 1, serve as the framework for the new method's structure [33]. To make the procedure more efficient, the 9 RUP principles have been divided into 7 divisions. Each phase may make use of one or more of the seven disciplines; however, only the most important professions are shown in Figure 1. That domain of business modeling is the most important actor at the genesis phase. During the requirement analysis, the professions of design and development are most often used. The initiation and planning disciplines are primarily concerned with the building phase, while the installation and customization professions are concerned with the transitional period [34]. Table 5 depicts

Table 5: Prototype of RUP hybrid standards.

Hybrid	RUP
Business modelling	Business modelling
Analysis and design	Requirements
Implement	Analysis and design
Testing	Implement
Deployment	Testing
Configuration	Deployment
	Configuration and change management
	management
	Project management
	Environment

the seven specialties of the subscription algorithm, as well as the nine specialties of both the traditional RUP methodology. Scrum's rituals (project Status meetings and scrum meetings), functions (construction manager, workforce, and end-user), and artifacts (project schedule, product roadmap, and sprint backlog chart) can be seamlessly integrated into the RUP stages without creating any issues or disruptions. In each RUP phase, it is possible to perform iteratively the meeting [35]. Is usually, the monthly Scrum of Scrums, the Requirement analysis discussion, and the Sprint action plan in addition to the weekly coaching session. As part of the economic tough and strong, the project sponsor may develop a product log that contains details about the product. Every Scrum Master (SM) may also do the typical tasks associated with the Scrum method. Because of the requirement gathering phase and the sprint meetings, the tasks specified in the project schedule and the Requirement specification may be completed and tracked. Typical phases of the subscription algorithm are shown in Figure 2, which is a diagram. In Figure 2, the

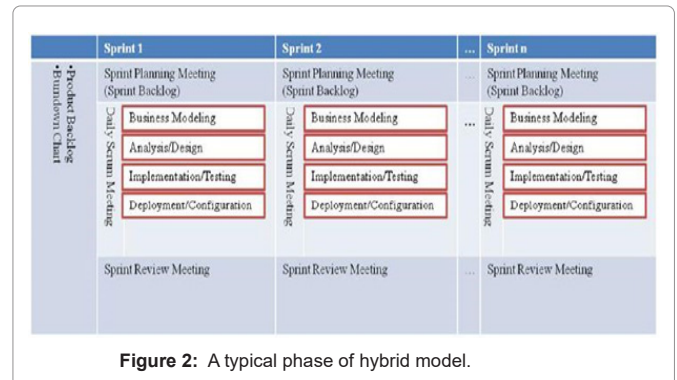


Figure 2: A typical phase of hybrid model.

development process and the burndown control chart are shown in the lower-left corner, respectively. Such Sprint artifacts may be shared with other people Training sessions are shown at the beginning of each column, with several sprints per row. The project charter and the Rapid action plan are held at the beginning and conclusion of each

iteration. The project Status discussion provides an opportunity to keep track of the seven RUP practices. The application of the 7 RUP categories will vary depending on how far a project has progressed [36]. A Sprint may be focused too much on the business modeling discipline than on other disciplines, for example, at the conception phase of the project. The second and third sprints, on the other hand, may make more use of the disciplines of analysis/design and implementation/testing. A typical phase consists of several Sprints, although each phase may include just one or two Sprints based on the scale of a project, as shown in the table below [37]. We can still offer a simple, systematic, and organized procedure in our hybrid technique, as illustrated across both Figure 1 and Figure 2 by maintaining the four key stages of RUP throughout the process. But since RUP incorporates the agility of Scrum into its development process, the hybrid approach will suffer in terms of unpredictability, reliability, and excellent quality assurance. An additional advantage of using a hybrid approach will be the flexibility to deal with quickly changing company needs [38]. It is anticipated that the improvement in flexibility of the hybrid approach would result in a reduction including over and postponed schedule problems, respectively. The four main phases and seven professions of RUP may be used as a method platform, while the procedures, roles, and artifacts of Scrum can be used to provide administration and accountability techniques in the newly designed prototype, as previously described.

Conclusion

Typical project management techniques can offer a simple, systematic, and organized procedure in computer programming. However, the traditional techniques have limitations, including sluggish adaptability to quickly changing customer needs, a propensity to go over budget and then behind time, a lack of significant gains in efficiency, dependability, and accessibility. Agile project management techniques may offer a faster development phase, better customer engagement, reduced bug incidences, and easier adaptability to quickly changing business goals. Like the traditional technique, the agile processes also have limitations, including 1) Substantial decrease of documenting and strong reliance on intangible assets, 2) Inadequate test for the massive, expedition, and conservation projects, and 3) Insufficiency for very stable projects.

This article proposes a novel hybrid model/method, which blends the Analytical Hierarchy Process with Sprint to maximize the benefits of both traditional and agile techniques while attempting to minimize the weaknesses of each methodology. The Advanced Oxidation Process is utilized as a foundation in the hybrid approach while Scrum is integrated within the requirements engineering process to provide software development and tracking methods via defined ceremonies, roles, and artifacts. It would indeed be useful to analyze incorporating the concepts of Xtreme Programming (XP) into another hybrid technique. This could be an excellent research directions subject.

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