Hybrid Scrum-XP: A Proposed Model based on Effectiveness of Agile Model on Varieties of Software Companies in Bangladesh

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Abstract—The Agile Methodology is a term which refers to a method of software development that is incremental and iterative in nature and is used to manage and incorporate constantly changing needs. This entails decomposing the entire development process cycle into a series of tasks. The process is further divided into a number of sub-tasks, each function is independently. The Agile Development technique, which is a popular and growth-oriented strategy, provides not only speedy project delivery, but also software responsiveness, which leads to total corporate growth and agility. The organization's project management capabilities and performance are improved through the adoption of Agile practices. In their business, the companies employ Agile methods. As a result, the goal of this study is to see how effective agile approaches are in Bangladeshi software organizations. A survey of established software companies in Bangladesh is being conducted to accomplish the objective. The Scrum and XP agile technique is the most widely used according to the findings. It is proposed that Scrum and the XP model be combined to achieve maximum effectiveness and overcome their respective limits.

Index Terms—Agile, Agile life cycle, Agile development Scrum, Scrum life cycle, XP, XP life cycle, Hybrid Scrum-XP model

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I. INTRODUCTION

In this technological decade, technologies are emerging quicker, and software development organizations must operate in a fast-paced, ever-changing environment to compete. Because gathering all requirements and clarifications for changing development is impossible, software development methods fail to deliver the desired product. The agile model can help software development organizations in this position because it is specifically built to deal with these situations in this fast-changing world of software development and follows incremental development for product enhancement [1].

The agile model can build and deliver the product that customers require at any moment and handle any form of change on time. It can also quickly add new requirements to the product as a new feature. Agile acquired popularity in the area due to this conception. The old waterfall strategy provides enterprises with a more flexible, efficient, and results-driven means of achieving their technology innovations [2]. It employs various approaches centered on the ideals of flexibility, transparency, quality, and continuous improvement. Iterative of agile method and incremental nature assists teams in meeting the demands of today's workplace. Each feature is broken down into the tiniest sprints of work, and cumulative value is delivered over time. This method's effectiveness depends on shorter iterations and a level of team collaboration that is uncommon in traditional techniques.

The most extensively utilized agile frameworks in the software industry are Scrum and XP. The majority of projects in Bangladeshi software companies are completed using the Scrum or XP agile frameworks. Both frameworks function similarly. Iterative development, functioning software, release and iteration planning, daily meetings, and retrospectives are all parts of the Agile process shared by both Scrum and XP frameworks. It can be challenging to decide if a project should use Scrum or XP because both frameworks are similar [3].

In a nutshell, both agile methodologies in the software business are pretty demanding. However, every method has flaws. Some are also seen in Scrum and XP. If the most significant features of Scrum and XP can be merged in a single model, it might be an excellent agile method for today's developing software firms in Bangladesh.

The success of agile techniques in Bangladesh software

firms will be discussed in this study and how agile approaches are used to develop software companies in Bangladesh. This research study will discuss the advantages of agile frameworks in the Bangladeshi software sector. A hybrid model based on Scrum and XP will be offered in this study to apply the agile framework in the software industry. This article will also address whether or not a Hybrid Scrum-XP approach will be acceptable to software companies in Bangladesh.

II. RELATED WORKS

Bangladesh's software sector is steadily improving. The difficulties in enhancing or developing software firms include determining the most appropriate development strategies and achieving the desired results. In this challenging session, the agile model is the ideal way. The features of agile approaches to software companies, such as iteration, lightweight, software design, development methodology, effective management, quality assurance, and productivity and maintenance practices to develop quality products, are best suited for improvement in the software industry.

Agile development approaches have gained popularity in the software industry due to their ability to create high-quality products quickly. Customers' needs and company goals were the emphases of these techniques. Agile fosters positive client-developer relationships. Scrum, Extreme Programming (XP), Crystal, Dynamic System Development Method (DSDM), Feature-Driven Development (FDD), Adaptive Software Development (ASD), Kanban, Agile Unified Process (AUP), and Lean Software Development (LSD) are just a few of the frameworks used in Agile (LSD). Scrum is utilized in 58% of software businesses, XP is used in 24% of software companies, and DSDM is used in 18% of software organizations [4]. In [5], authors presented a study to determine the best agile SDLC in the software industries of Bangladesh.

According to some research, Scrum and XP are the most general agile approaches in Bangladeshi software businesses. Furthermore, owing to the specific aspects of Scrum, such as the presence of daily stand-ups and the evaluation of work increments after each sprint, interest in Scrum has grown over time, whilst interest in XP has declined [6]. Scrum seeks to manage software projects to enhance the likelihood of successful software industry development, whereas XP focuses on the project level activities of software industry implementation. Scrum and XP, on the other hand, both adhere to the core principles of agile software development. An analysis of industry used SDLC methodologies is presented in [7] by authors.

When compared to other techniques, Scrum has been in use for a considerably longer time. Scrum is a popular agile methodology, along with XP. Because of its broad use, simplicity, flexibility, and adaptability in changing circumstances, Scrum was picked as the most successful approach for managing projects, along with XP practices. The primary goal of Scrum is to adapt to any changes in requirements that occur during the development process. It is a highly adaptable development method that follows the iterative and incremental development idea. Scrum encourages

collaboration by bringing together many cross-functional teams to meet product goals [8] [9].

Scrum is an agile methodology framework that focuses on day-to-day project management. It is the most extensively used agile project management method. According to a survey, Scrum provides the best ways for saving time and providing quality, with a focus on "Easy to use" and "conformance to standards". As a result, Scrum has a beneficial impact on project time, cost, scope, quality, risk, and scope and also Scrum helps decrease risk, control costs, and deliver a high-quality product on time [10].

A modified multi-mode resource-constrained project scheduling model (MRCPSSP) is presented in the hybrid Scrum method, and it is added to a given Scrum flow. Scrum is utilized in software businesses as a modified form that combines small and large projects.

XP is a lightweight technique for small to medium-sized teams producing projects based on quickly changing objectives. The goal of XP is to take valuable software engineering principles and ideas to "extreme" levels of understanding. The XP project was delivered a little faster (50 percent time overrun vs 60 percent for the regular project) and at a lower cost (25% vs 50% for the traditional project) [3]. Scrum and XP are two agile development approaches that are extensively used today. Although XP and Scrum have some advantages, they also have some drawbacks. Scrum does not offer much more product engineering, whereas XP lacks management methods [8].

It can be seen that various research works have been conducted over the time on Agile software development strategies. Among the research works very few can be seen that focuses on the perspective of software industries in Bangladesh. This research work aims to focus on an effective hybrid agile model development focusing on the Bangladesh perspective.

The proposed approach incorporates elements of XP, which offers engineering techniques, Scrum, which offers effective management practices, and DSDM, which concentrates on offering a strong foundation to start a project. Technical writing plays a further part in excellent documentation, which improves the software's maintenance and understandability [29].

Organizations can choose from a variety of software development methodologies, including traditional and agile approaches. Project managers and other team members were surveyed on how they employ software development approaches. The findings show though the Waterfall is still widely used, Agile alternatives like Agile Unified Process and Scrum are more common around 10 years ago. It is interesting to see how the software companies adopt the hybrid approach to develop their projects [30].

Many firms are adopting agile methods in the workplace to manage and develop IT projects. The authors of this paper suggest a novel technique of combining Scrum for developing and managing projects. An agile project creation and management methodology with more traditional plan-driven project development and management. They looked at how agile is now being used in businesses. Teams are more focused

on generating high-quality software established applying agile principles [31].

From the above discussion it can be seemed that most of the related studies has proposed their model based on theoretical concept. But in this paper, a model is proposed based on real data that is collected from top leading software companies in Bangladesh. While also considering the facts and findings of the related works.

III. METHODOLOGY

Every research technique aims to add new knowledge to the global community's knowledge archives by creating further information. In this section, the strategies were examined to get or expand information. The appearance of the research work and the procedures used to achieve the result. The research procedure was maintained as below Figure 1.

This is the first approach that will provide the effectiveness of agile methods in Bangladesh software industry. The benefits of agile methods are discussed in software projects and how they work for software companies and develop them in the software industry.
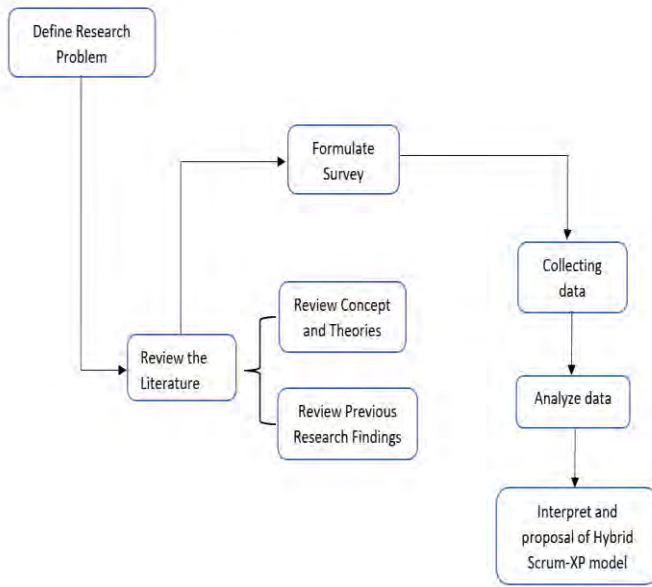

Figure 1: Research Process

In the second approach, a survey is conducted with some questions about agile approaches, the benefits and drawbacks of working with agile methods, and which ways are superior. It was learnt that Scrum and XP are the most popular software development methodologies. As a result, the survey is also included some questions about Scrum and XP.

A survey is conducted through which responses on current agile practices from various leading software companies are collected. The benefits and drawbacks of using agile methods, and which methods are suitable for the industry are also incorporated. There are also important inquiries concerning the benefits, disadvantages, and limitations of Scrum and XP. Crucial queries about the proposed Hybrid Scrum-XP approach are also included to get valuable feedbacks from the industry.

Table 1: The points of the survey conduction

Variable	Description
Preferability of Agile Method	According to a review of literature, Agile development methodologies have become more popular in the software industry because they can produce high-quality products fast and Scrum and XP are the agile frameworks that are most commonly used in the software industry.
Benefits	The advantages of using scrum and XP were discovered through a review of various top software companies.
Drawbacks	A survey was conducted from various leading software companies to found the drawbacks of using scrum and XP.
Limitations	The limitations of using scrum and XP were discovered through a review of various top software companies.
Efficiency	The drawbacks and limitations of both Scrum and XP are covered with the benefits of Scrum and XP to improve the efficiency of proposed Hybrid Scrum-XP

According to a review of the literature, Scrum and XP are two popular agile methodologies that are most frequently utilized in software firms in Bangladesh. There were important variables concerning the benefits, disadvantages, and limitations of Scrum and XP. In order to gather information on current agile methods survey questions were prepared based on those variables explained in Table 1.

For this study, to collect industry data from the leading software companies in Bangladesh, first, the list of leading companies was extracted from the official website of BASIS, which is an association of leading software companies of the country. The research is a mix of qualitative and quantitative approaches. The survey questions were formulated based on the research goals of this study so that the data collected through the survey can attain the goal to propose a hybrid model. For countrywide COVID situation, the survey was carried out online via Google Form. The survey has focused on software firms to see what benefits and drawbacks are being expected while adopting to the various software models. The survey responses are available at [11]. Representatives from 33 leading software firms have participated in the survey. They survey results are analyzed with respect to the research need and existing literature, how they relate and differentiate. Finally, this study draws conclusions based on the analytical result.

The survey questions were divided into two parts; 1. The Agile Method is used in the software companies and 2. About the proposed model Hybrid Scrum-XP model. So, in first three questions are about Agile Methods used in the software companies.
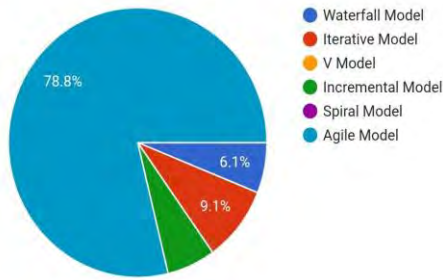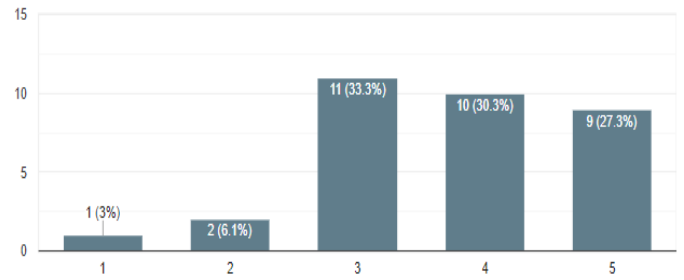
Figure 2: Preferable model for the software company

Figure 3: The type of Agile Methods is used in software companies

Figure 4: The preferable Agile Method
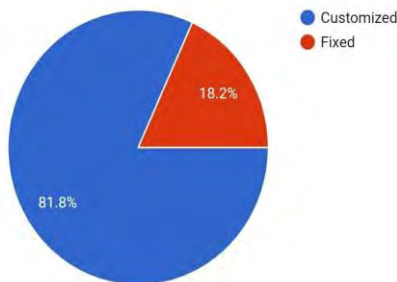
From the above pie chart, the responder had chosen the Agile Method and Scrum. They also preferred to have the customization in the models so that they can customize the process according to their projects or works.

The last questions are about the proposed model Hybrid Scrum-XP. Positive responses are received from the Bangladeshi's software companies.
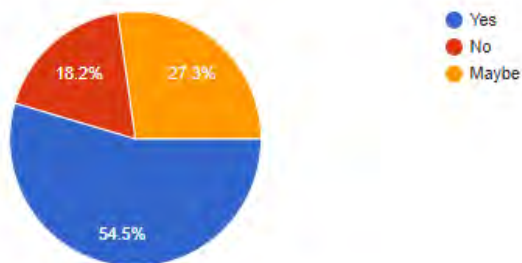

Figure 5: The software company prefers to use Hybrid Scrum-XP

Figure 6: Cost-effectiveness of Hybrid Scrum-XP in Bangladeshi software companies

Figure 7: The chance of being successful using Hybrid Scrum-XP in software industries of Bangladesh

In the last three charts, it is the outcome of the proposed model which is Hybrid Scrum-XP model. The responder responded positively.

In the last, a proposed Hybrid Scrum-XP is discussed that provides some new developing ways in the software industry.

IV. PROPOSED HYBRID SCRUM-XP MODEL

Agile refers to something quick or adaptable. The "Agile process model" refers to a software development approach that is based on iterative development. It is most commonly used for short projects, frequent modifications, a highly qualified and experienced team, client collaboration, etc.

The Agile model is divided into stages, which are as follows: Planning, Requirements Analysis, Design, Iteration, Testing, Deployment, Review. Here is the diagram of the life cycle of the agile method.

Figure 8: Life Cycle of Agile Method

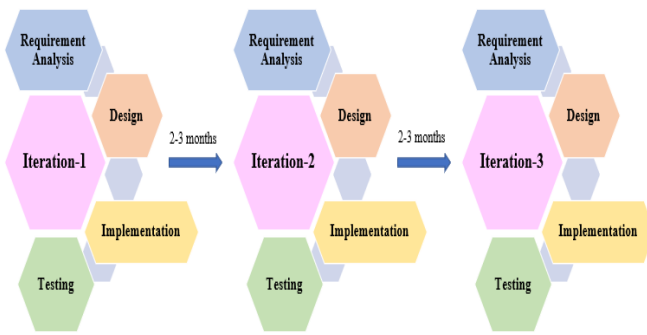This is the iteration phase of the agile method which is given in the Figure 9.

Figure 9: Iteration of Agile Method

The Scrum framework provides a framework for organizing and managing a program's moving pieces. Scrum is a renowned Agile subset that offers a product development iterative process framework. Its popularity stems from its fixed-length iterations, or sprints, which divide the development process into small tasks, reducing chaos and miscommunication while moving the project forward. Scrum Model Phases are: Product Backlog Creation, Sprint Planning and Sprint Backlog Creation, Daily Scrum Meetings, Product Increment and Sprint Review, Retrospective and Next Sprint Planning. The given diagram is about the Scrum Life Cycle and Iteration of the Scrum is described in Figure 10 and Figure 11 respectively.

Figure 10: Life Cycle of Scrum

The life cycle of the XP project is the amount of time it takes to complete it. It starts with the planning stage and finishes with the consumer receiving the finished product. XP is an Agile methodology, as it has been already established. It follows the iterative cycle principle. Here is the diagram (Figure 12) of the life cycle of XP method.
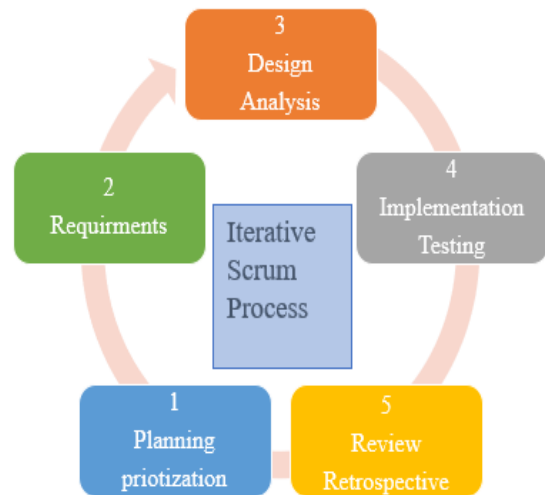

Figure 11：Iteration of Scrum

XP has the following activity levels: Product Life Cycles, Releases, Iterations, Tasks, Development, Feedback. The diagram of the activity levels is given in the Figure 13.
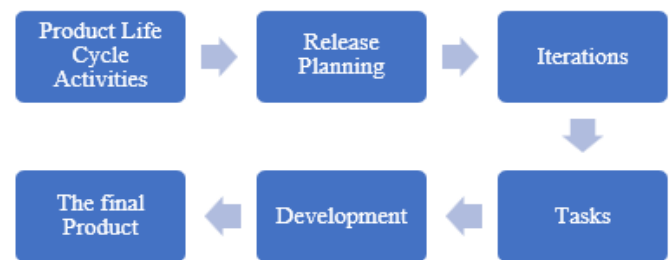

Figure 13: Activity Levels of XP

Despite having lots of advantages, both Scrum and XP have some limitations. So, the two models, Scrum and XP, are decided to customize together to overcome the limitations of those models and to get a more effective model for software companies in Bangladesh called the Hybrid Scrum-XP model. Here is the diagram of the life cycle of the proposed model and the comparison table are given in Figure 14 and Table 2 respectively.

A survey is conducted through which responses on current agile practices from various leading software companies are collected. The benefits and drawbacks of using agile methods, and which methods are suitable for the industry are also incorporated. There are also important inquiries concerning the benefits, disadvantages, and limitations of Scrum and XP. Crucial queries about the proposed Hybrid Scrum-XP approach are also included to get valuable feedbacks from the industry. There was a positive response to the preference for using hybrid Scrum-XP, and the survey results were similar to those of a literature review. Thus, Hybrid Scrum-XP is proposed in Table 2 where the drawbacks and limitations of both Scrum and XP are covered with the benefits of Scrum and XP to improve the time and cost efficiency in software companies in Bangladesh.
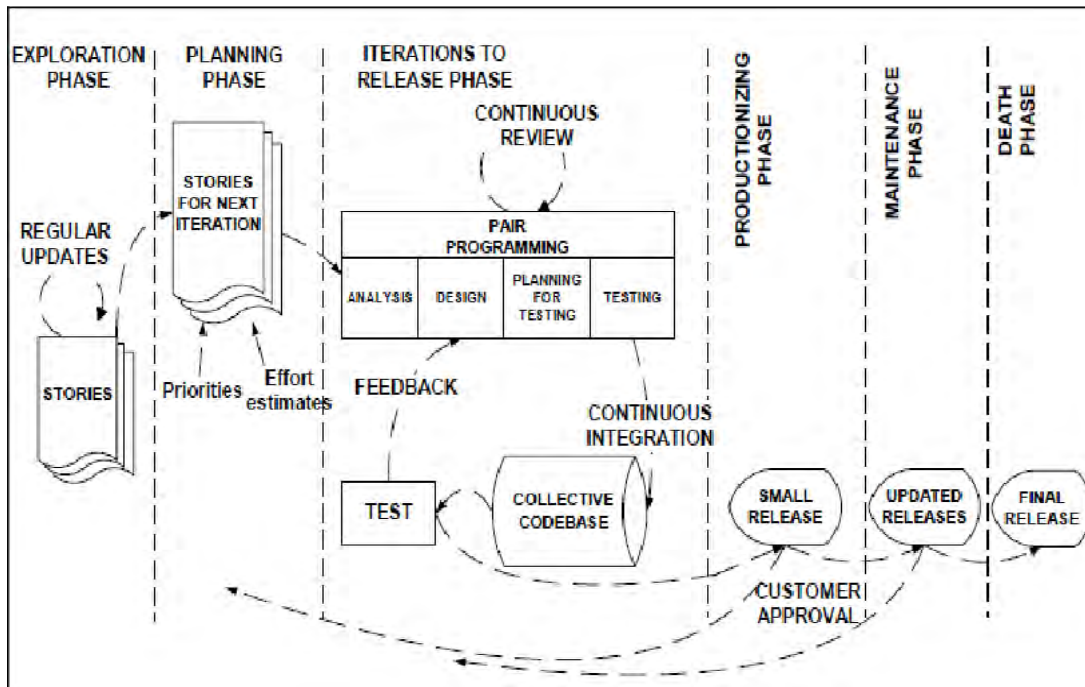
Figure 12: Life Cycle of XP

In this study, the proposed hybrid model that combines XP and Scrum. To collect the real data from top leading software companies in Bangladesh, the survey was conducted. From the survey, the maximum efficiency and the benefits of the used models were learnt. According to related study and the survey, Scrum and XP are the most popular agile models in software companies.
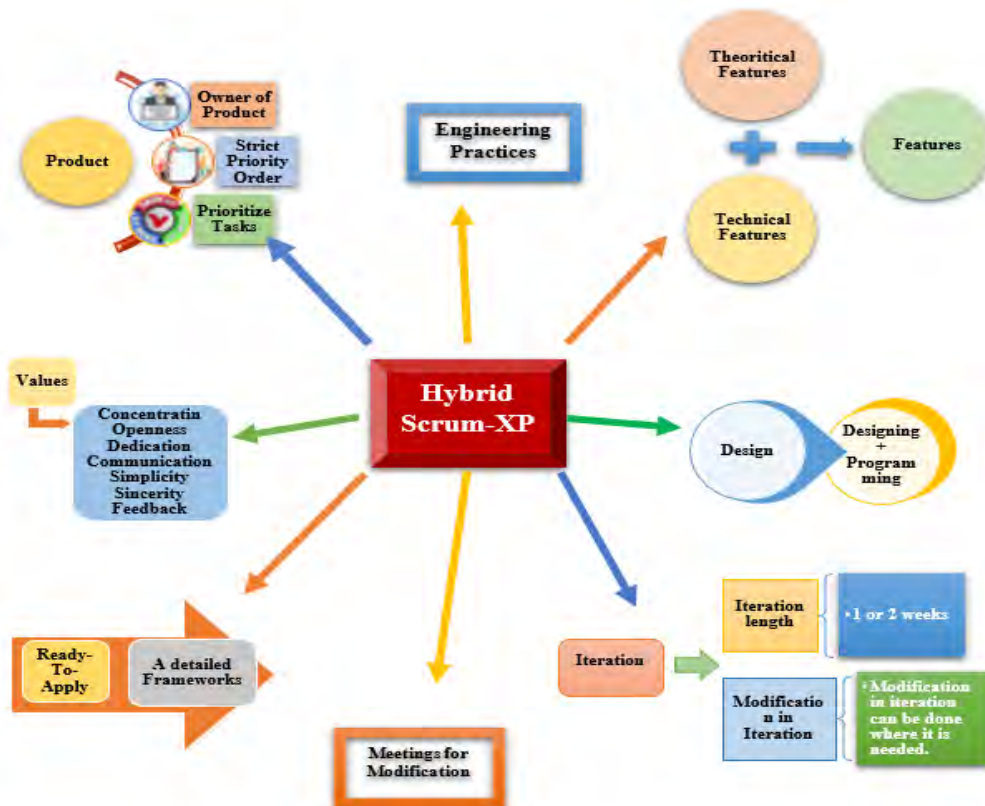

Figure 14: Life Cycle of Hybrid Scrum-XP Model

The limitations of Scrum can be solved by XP and the limitations of XP can be solved by Scrum. Therefore, if any software companies implement the proposed model; they will achieve maximum efficiency.

Table 2: Proposing Hybrid Scrum-XP model by comparing Scrum and XP

Items	Scrum	XP	Hybrid Scrum-XP
Iteration length	The duration is usually between two and one month.	The duration is usually between one or two weeks.	The duration should be between one or two weeks.
Modification in an Iteration	Allow no modifications to their sprints.	Within their iterations, they are much more comfortable with change.	As long as the team hasn't begun developing a specific feature, a new feature of comparable size can be changed into the iteration in place of the unfinished feature.
Designing	Scrum focuses on both designing and code.	XP mainly focuses on code than designing.	This model should equally focus on code and designing.
Owner of Product	The scrum master consults with the product owner to determine the story sequence and discusses each phase with the team.	The customer is the product's owner, and they determine task priority and reviews releases.	In Hybrid Scrum-XP, the project master will consult with the product owner and will do the priority order with the team.
Strict Priority Order	The owner of Scrum products prioritizes the product backlog, but the team decides how to develop the backlog items.	Strictly follow the given priority order.	The product owner will prioritize the product backlog and the team will decide where the backlog items are developed.
Prioritizing tasks	The product owner determines the priority, but teams can freely work on whatever they wish throughout the sprint.	Customers' job preferences guide the team's work.	The customers should set the priority, but teams should have the permission to add their knowledge with the customer's requirements inside that sprint
Strict Priority Order	The owner of Scrum products prioritizes the product backlog, but the team decides how to develop the backlog items.	Strictly follow the given priority order.	The product owner will prioritize the product backlog and the team will decide where the backlog items are developed.
Prioritizing tasks	The product owner determines the priority, but teams can freely work on whatever they wish throughout the sprint.	Customers' job preferences guide the team's work.	The customers should set the priority, but teams should have the permission to add their knowledge with the customer's requirements inside that sprint
Engineering practices	Scrum focuses on self-organization	XP focuses on strong engineering practices.	This model should focus on engineering practices. But if needed, self-organized methods can be applied.
Technical-Features	Scrum does not specify which software technique should be used by developers.	XP focuses on the programming techniques that developers should employ to get a high-quality outcome.	In Hybrid Scrum-XP, technical features will be followed like XP.
Meetings needed for modification	If there needed any modification, the team could not modify by themselves without doing meetings.	If there needed any modification, the team could not modify by themselves without doing meetings.	There should arrange one meeting to describe the thoughts of teams and then applied to the project.
Ready-To-Apply	The Scrum framework is not defined in detail. If one wishes to use it, he should fill it with XP, DSDM, or Kanban frameworks.	Extreme Programming (XP) can be used to improve a team's productivity. The Ready-to-Apply characteristics of Extreme Programming are well-known.	In Hybrid Scrum-XP, Ready-To-Apply characteristics will be followed.

Items	Scrum	XP	Hybrid Scrum-XP
Values	Openness, concentration, and dedication are among the values of Scrum	Communication, simplicity, and feedback are valued in XP.	In Hybrid Scrum-XP, all the values of Scrum and XP will be followed.
Best Suit-in	Scrum is best at the project management level.	XP is best for the engineering methods that developers employ on a daily basis.	In Hybrid Scrum-XP, the project management level's tasks and also the engineering methods will be followed.

V. CONCLUSION

The proposed customized Hybrid Scrum-XP model can be most effective for software companies in Bangladesh. Most of the software companies use Scrum and XP methods; the combination of Scrum and XP model can be overcome the limitations of both and get the expected results of software companies. A shorter sprint allows for more accurate progress tracking. In actual life, Scrum is not always perfect. Because it is usual for production issues to develop as a sprint begins, leading the business to be disrupted. This model will be cost-efficient and can be maintained easily. The software companies in Bangladesh use a range of agile approaches in their software development. Although these approaches are appropriate for small and medium-sized projects, they are useless in practice. In Bangladeshi software firms, traditional agile methods have proven difficult to implement. Most people from various software companies in Bangladesh have responded positively to the proposed Hybrid Scrum-XP model and preferred the proposed model to implement and apply in software companies.

The Hybrid Scrum-XP model should be developed and used in numerous software organizations in Bangladesh before moving on to the next level. According to the survey findings, this model might be the most successful; nevertheless, limitations should be identified to reach minimal limits and maximum efficiency because nothing is fully efficient. To apply the collected data into practice, the one who will work on this model can take findings and use them to businesses to identify constraints, and allowing them to modify the limitation-related parts of the model by adding more essential elements from other models or removing some features to make it more effective for software companies.

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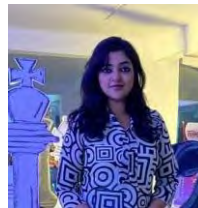
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