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Scrum Effectiveness Measurement in Human Resources Technology Product at Telecommunication Company

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Abstract

Information technology currently sues the release of application become faster to fulfill market demand. The term application has become an ordinary thing to be used daily to support various kinds of work activities. Agile software development has become a new standard to catch up stakeholder needs that are growing faster and tending to change. One of agile practices, Scrum, is the methods used by Human Resources Technology (HR Tech) product. However, since HR Tech was established by using Scrum, measurement needs to be done to understand its effectiveness. Measurement use knowledge area defined in PMBOK 6 and mapped to agile-scrum process as the baseline to find out the effectiveness. Research was done by spreading questionnaires to the internal team of HR Team. The supporting data used internal company report. Furthermore, the research was processed by using validity and reliability to evaluate scrum process inside the product. The results show the top three knowledge areas need to be concerned to increase scrum effectiveness, there are communication, schedule, and quality. According to the knowledge areas which HR Tech need to be improved, future research should be done to demonstrate the proposed recommendations are appropriate with the case study.

Keywords: Scrum Effectiveness, PMBOK, Agile Process, Software Development

I. INTRODUCTION

Currently, either technology or non-technology companies are using computers to help and complete their business. [1]. Computer applications have been used in various kinds of work, such as telecommunication, retail, bank, government, automotive and others. To accommodate various kinds of business process inside work, rapid software development is increasingly in demand and needed, that is why Agile methodology become popular. Agile implementation both methods and practices are extensively adopted by project team for software development [2].

Agile is currently the main software development methodology, the methods heavily used are Scrum and Extreme Programming [3] [4]. Agile introduced in 2001 to improve previous methodology, Waterfall [5] [6]. Waterfall is felt to have drawback in following nowadays industry culture, nimble process changes. Scrum initially was a standard product development introduced by Hirotaka Takeuchi in 1986. A group of people in 1993 consist of Jeff Sutherland, Jeff McKenna and John Scumniotales used Scrum for software development process at Easel company for the first time. Figure 1 shows how Agile has a greater success rate compared to Waterfall [7].

Scrum effectiveness analysis has been done multiple times before. Five high level factors proposed by Verwijs and Russo (2022) [8] there are responsiveness, continuous improvement, stakeholder concern, management support, and team autonomy. Five critical success factors also found by Lase et al. (2022) [3] there are organizational, process, project, technical and people factor. Learning Scrum knowledge use simulation such as game was one the effectiveness way to increase participation to use Scrum [9].
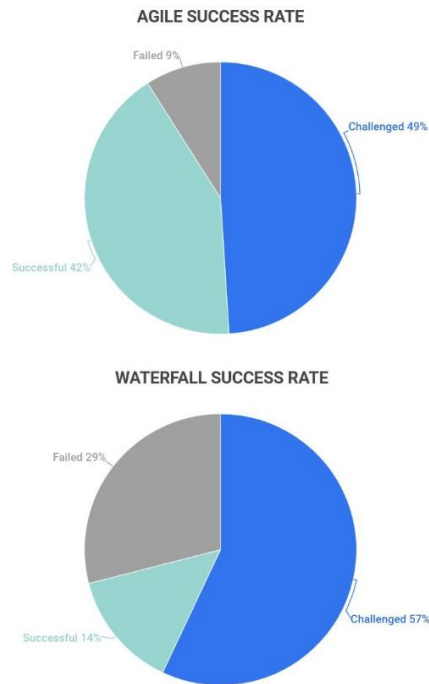
Fig 1. Agile vs Waterfall success rate

According to several internal reports and interview result with Chief Executive Officer (CEO) and Product Owner (PO), Scrum implementation in Human Resources Technology (HR Tech) product in 2022 showed that there were many no completed sprint. Another thing should be concerned that there was a sprint that no have completed task. In the same year, quarter two and quarter three identified that customers satisfaction by Service Level Survey (SLS) didn't show user expectations. The scrum team itself was frequently changed. Another problem is lack of management knowledge from helicopter view or no roadmap for product development. The development was only based on quarter targets. Thus, scrum practices need to be evaluated and propose some good ways for the future.

The rest of the paper is ordered as follows. Literature review will discuss agile-scrum, PMBOK and measurement method in section II. Section III will focus on research methods and how this research will be conducted. Section IV will show the result of the research after measured the scrum effectiveness. The rest of the section will show the conclusion of this research.

II. LITERATURE REVIEW

A. Agile-Scrum

Agile declared and published its document in 2001 with Agile Manifesto [10]. This promises more responsive and collaborative in software development for over decade instead of Waterfall methodology [11]. Agile objective is to minimize exceeded project budget and boost the software business value [12]. One of the phenomena agile methods hyped in the market is Scrum [1] [6]. According to several sources, Scrum is a framework or methodology designed to solve complex problems with set of timebox, iteration and increment to deliver high product values.
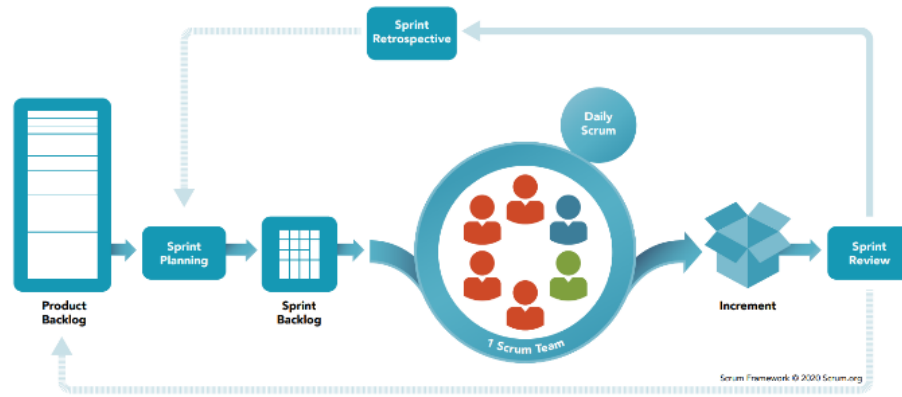
Fig 2. Scrum Framework
(Source: Scrum.org (2023))

Inside the body, Scrum team is divided into three components, namely Product Owner (PO), Scrum Master (SM) and Developers [13]. It has five formal events, there are the sprint, sprint planning, daily scrum, sprint review and sprint retrospective [14]. Figure 2 shows the general flow of Scrum framework. The work or value of scrum is represented by Scrum artifact. It consists of three things i.e., product backlog, sprint backlog and increment. The relationship between scrum team, scrum events and scrum artifact are shown in figure 3 to determine the Scrum works.
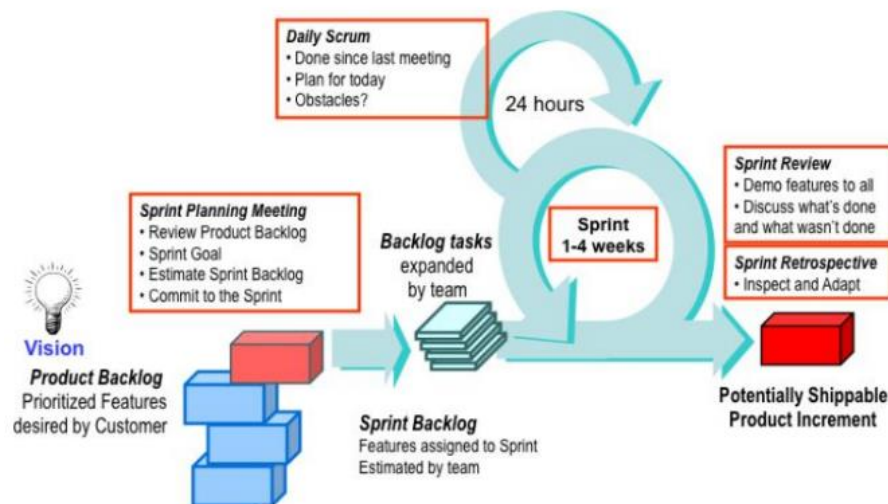

Fig 3. The Scrum works
(Source: Hema et al. (2020))

B. Project Management Body of Knowledge (PMBOK) 6th Edition

Knowledge area project management in PMBOK 6th described into 10 areas. [15]. Knowledge area defined by PMBOK 6th consist of Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management, Project Stakeholder Management. There was mapped PMBOK 6th knowledge area with agile process that showed their correlation [16]. It was said from previous research that one knowledge area of PMBOK is not considered part of Agile, namely Project Procurement Management. Another researchs also define the challenges of process area compared with agile [5] [17].

C. Validity and Reliability

The validity of data should be valid after pre-processed by testing [18]. The validity test will be compared with r table. If the test value greater than r table value, the question is considered valid [19]. The value of r will lie from -1 to 1 [20]. The reliability test is needed to ensure that measurements can produce the same results using the same data [21] [22]. Reliability test using Cronbach's Alpha (α) is used to measure data consistency in research instrument [23]. Cronbach's Alpha's value is divided into two parts, if value > 0.6 means reliable, meanwhile if Cronbach's Alpha value < 0.6 means not reliable.

III. RESEARCH METHOD

Research flow started by finding the problems. Afterward, identify the process to solve the problem. The goal is to propose recommendations. Research details are shown in figure 4.
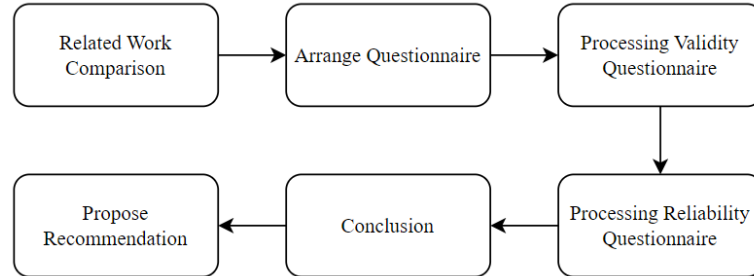

Fig 4. Research Flow
(Source: Author Processing)

Analyzing the process used qualitative method, questionnaire. Hence, questionnaire questions are built by needed case in HR Tech product. Inside the product consists of two teams. Team composition is figured out in table 1.

TABLE 1
TEAM COMPOSITION

Role	Team A	Team B
Product Owner	1	1
Frontend Developers	2	2
Backend Developers	2	2
Quality Assurance	2	2
Document Engineer	1	1
Scrum Master	1	
Total	17	

Since the survey taken from scrum team that focus on software development, seven chosen knowledge areas become research focus. Knowledge areas survey mapped in table 2.

TABLE 2
KNOWLEDGE AREA QUESTIONNAIRE

Knowledge Area	Question	Question Number
Scope	▪ Does the product have a clear scope of work?	1.1
	▪ Is product scope of work easy to follow up when unclear?	1.2
Schedule	▪ Does the product always release in suitable scheduled?	2.1
	▪ Do the Scrum Team have good time management inside Sprint?	2.2
Resource	▪ Do the Scrum Team collaborate well to achieve the same goal?	3.1
	▪ Do the people allocation already fit in each team?	3.2
Quality	▪ Does the software development fit with agreement of Definition of Done?	4.1
	▪ Does the quality of product as expect as stakeholders?	4.2
Risk	▪ Do the teams can adapt when management changes?	5.1
	▪ Do the teams relationship well maintained when a problem come?	5.2
Communication	▪ Do the teams can communicate as the context in Scrum Event?	6.1

Knowledge Area	Question	Question Number
	▪ Do the teams have opportunity to communicate with outside Scrum Team for product development?	6.2
Stakeholder	▪ Does the coordination process in Scrum team work well?	7.1
	▪ Do the stakeholders needs could be understood by team?	7.2

IV. RESULTS AND DISCUSSION

Research results taken from the qualitative method using questionnaire. The questionnaire was given to 17 respondents, while only 16 respondents submitted the form. Evaluation 16 respondents' data shown at table 3. First, sum every score from each respondent. Questionnaire validity measured by using the Correlation Data Analysis then the result shown at appendix 1.

TABLE 3
SCORING RESPONDENTS' FEEDBACK

R	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	Total
1	5	5	3	5	5	5	4	3	5	5	5	4	5	5	64
2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	70
3	5	4	4	5	5	4	4	3	3	4	3	3	4	3	54
4	5	4	3	4	4	4	4	4	4	4	5	4	5	4	58
5	4	4	2	3	4	2	4	3	5	5	5	4	5	4	54
6	4	5	3	4	5	3	4	3	5	4	4	2	4	4	54
7	2	4	3	4	5	2	4	4	4	4	4	3	4	1	48
8	4	4	4	5	5	5	5	4	5	5	5	5	5	4	65
9	4	4	4	4	4	3	4	4	4	4	4	4	4	4	55
10	4	5	3	5	5	4	5	4	4	5	5	3	5	4	61
11	4	4	3	4	4	4	3	4	4	4	5	4	4	4	55
12	4	4	3	3	4	3	4	3	4	4	4	4	4	4	52
13	5	5	4	4	5	5	5	5	5	5	5	5	5	5	68
14	5	5	2	4	5	5	5	4	5	4	4	4	4	5	61
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	70
16	4	3	3	4	4	2	4	4	5	3	5	4	4	4	53

Following distribution table from r table, then value of df = 14 (df = N – 2, while N is total respondents) and significant value using 5% or 0.05 means 0.532 as figure 5. Based on r value, when test value under 0.532 then question need to be reviewed or deleted. The question was deleted because they didn't meet the minimum validity score provided by r value. Questions which have test value under 0.532 based on appendix 1 are number 3.1, 5.1 and 6.1.

N	The Level of Significance	
	5%	1%
3	0.997	0.999
4	0.950	0.990
5	0.878	0.959
6	0.811	0.917
7	0.754	0.874
8	0.707	0.834
9	0.666	0.798
10	0.632	0.765
11	0.602	0.735
12	0.576	0.708
13	0.553	0.684
14	0.532	0.661
15	0.514	0.641

Fig 5. R table

Appendix 2 describes validity measurement for the second time which no test value under 0.532. Afterward, test reliability calculated by Cronbach's Alpha equation [24].

$$r11 = \frac{k}{k-1} x \left\{ 1 - \frac{\sum Si}{St} \right\}$$

This equation explain that constant k is total indicator (respondents), while formula $\frac{\sum si}{st}$ is Total Varian divided by Total Score. Then, complete equation with value will look like this:

$$r11 = \frac{16}{16-1} x \left\{ 1 - \frac{6.44921875}{33.77734} \right\}$$

The result from the measurement is 0.889973401. Since the value is more than 0.6, means the questionnaire is reliable. The reliability score benchmarked from literature review at point C. Furthermore, the result mapped based on table 1.

TABLE 4
WEIGHTING RESULT

Knowledge Area (KA)	Quest. Number	Weight (%)	Average each KA	Weight Result (%)	Gap (%)
Scope	▪ 1.1 ▪ 1.2	20	86.88	17.37	2.62
Schedule	▪ 2.1 ▪ 2.2	15	76.25	11.44	3.56
Resource	▪ 3.2	10	76.25	7.62	2.4
Quality	▪ 4.1 ▪ 4.2	15	81.88	12.28	2.71
Risk	▪ 5.2	10	87.5	8.75	1.25
Commu-nication	▪ 6.2	20	78.75	15.75	4.25
Stakehol-der	▪ 7.1 ▪ 7.2	10	85.62	8.56	1.44

Table 4 shows the knowledge area scope and communication have the biggest role in scrum factor with 20% in weight. Second position is 15% in weight for schedule and quality. The last is resource, risk, and stakeholder for 10% in weight.
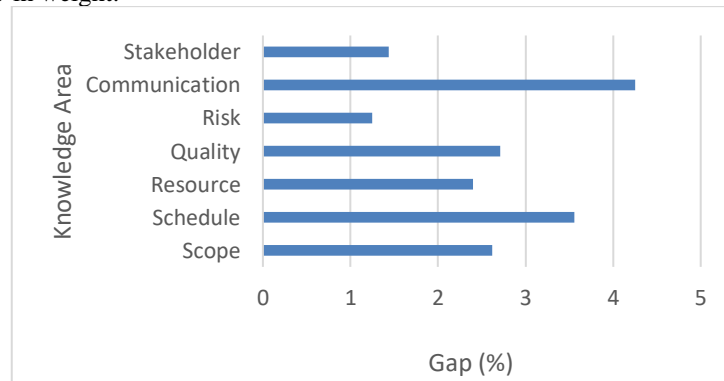

Fig 6. Gap Distinction

The top three knowledge area that should be concerned refer to figure 6 is sorted by the highest gap. Communication with 20% in weight ranked first. The second is Schedule with 15% in weight. Quality ranked three with 15% in weight.

V.   CONCLUSION

The result indicates when sorted by highest gap, the three knowledge areas should be reviewed and improved to make an effective of scrum increased. Communication is the major thing to be improved, daily scrum is one of the events that has crucial role in Scrum [16] [25]. At the event, scrum team can share status, raise problem until propose a solution. Schedule following the line in rank two. Proposed solutions for schedule are planned activities. Project Owner and Scrum Master can monitor to make sure the project or product is kept on track. The third is quality. The quality of scrum can be assessed by testing user stories and customer satisfaction. It can be evaluated from how the testing flow ran and satisfaction of customer. In general, the team can be trained or re-trained to refresh and improve their knowledge of Scrum. It can be held firstly from Scrum Master and can be continued by third party to bring wider knowledge.

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APPENDIX 1. Validity Measurement I

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13	Column 14	Column 15
Column 1	1														
Column 2	0.424216559	1													
Column 3	0.296758117	0.212904673	1												
Column 4	0.338341439	0.394055203	0.606449631	1											
Column 5	0.147083494	0.699896473	0.33895961	0.683130051	1										
Column 6	0.715541413	0.657259786	0.45978209	0.647945977	0.556858818	1									
Column 7	0.340264395	0.558877293	0.390959214	0.445742494	0.636682012	0.563235607	1								
Column 8	0.190008939	0.26215206	0.602556895	0.339422117	0.231869448	0.446948815	0.558415577	1							
Column 9	0.199336648	0.340502612	0	0	0.210818511	0.22576182	0.43768811	0.29329423	1						
Column 10	0.28846726	0.652173913	0.334564486	0.394055203	0.484543712	0.565012799	0.558877293	0.26215206	0.340502612	1					
Column 11	0.158636575	0.106965637	0.074827162	0.11633501	-0.132453236	0.24396795	0.208993208	0.460677879	0.586395472	0.449255677	1				
Column 12	0.424464714	0.047286624	0.474133348	0.142857143	-0.058554004	0.522537078	0.429533676	0.638113579	0.43204938	0.425579619	0.566163716	1			
Column 13	0.406894229	0.417028828	0.291729983	0.377964473	0.25819889	0.497701137	0.536056267	0.359210604	0.40824829	0.834057656	0.718184846	0.529150262	1		
Column 14	0.815913791	0.49904402	0.198139661	0.171139425	0.050104493	0.640295138	0.40916025	0.29044253	0.580962506	0.39114261	0.471191661	0.552535859	0.452792359	1	
Column 15	0.669325736	0.655385931	0.590247412	0.604664493	0.51025613	0.862829957	0.736508561	0.64564989	0.522489838	0.718177397	0.527163588	0.692874372	0.734022154	0.74141762	1

APPENDIX 2. Validity Measurement II and Reliability

Res	X1	X2	X3	X4	X6	X7	X8	X10	X12	X13	X14	Total Score	Total Varian	Cronbach Alpha
1	5	5	3	5	5	4	3	5	4	5	5	49		
2	5	5	5	5	5	5	5	5	5	5	5	55		
3	5	4	4	5	4	4	3	4	3	4	3	43		
4	5	4	3	4	4	4	4	4	4	5	4	45		
5	4	4	2	3	2	4	3	5	4	5	4	40		
6	4	5	3	4	3	4	3	4	2	4	4	40		
7	2	4	3	4	2	4	4	4	3	4	1	35		
8	4	4	4	5	5	5	4	5	5	5	4	50		
9	4	4	4	4	3	4	4	4	4	4	4	43		
10	4	5	3	5	4	5	4	5	3	5	4	47		
11	4	4	3	4	4	3	4	4	4	4	4	42		
12	4	4	3	3	3	4	3	4	4	4	4	40		
13	5	5	4	4	5	5	5	5	5	5	5	53		

Res	X1	X2	X3	X4	X6	X7	X8	X10	X12	X13	X14	Total Score	Total Varian	Cronbach Alpha
14	5	5	2	4	5	5	4	4	4	4	5	47		
15	5	5	5	5	5	5	5	5	5	5	5	55		
16	4	3	3	4	2	4	4	3	4	4	4	39		
Validity	0.714991458	0.643554	0.638429	0.621884	0.890257	0.720589	0.639314	0.697371	0.691796	0.699006	0.732482			
Variant	0.589844	0.359375	0.734375	0.4375	1.277344	0.339844	0.484375	0.359375	0.683594	0.25	0.933594	33.77734	6.44921875	
														0.889973401