ISSN: 1992-8645

www.jatit.org



HOW REMOTE WORKING CAN AFFECT EMPLOYEE PERFORMANCE USING SCRUM IN SOFTWARE DEVELOPMENT COMPANIES

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ABSTRACT

Context. Lately, the rise of remote work has increasingly become an alternative to being present in the office, especially for IT employees in software development companies. However, remote working is not easy. It requires personal skills and a supporting workspace, one of which is the internet connection. *Objective*. This paper seeks to understand the impact of remote working in Scrum software development. *Method*. The questionnaire survey was made mainly from existing and validated scales. The questionnaire received 316 responses from scrum practitioners. The data were analyzed using SmartPLS version 3.0 and applying PLS-SEM analysis, including inner and outer model testing. *Results*. The structural model achieved a good fit (SRMR = 0.073, NFI = 0.714). The research findings show that team influence has a more significant effect than individual influence on employee performance with the most significant effect is communication and teamwork in scrum teams. By knowing the factors that affect employee performance, company stakeholders can help facilitate employee and provide a platform for scrum activities to improve the project's development. We cover this topic, along with the limitations of future research and work.

Keywords: Remote Working, Scrum, Employee Performance, Software Development, Information Systems

1. INTRODUCTION

Remote working is a work flexibility plan in which employees can complete their duties and other official activities from an approved workplace other than the employee's usual office location. In recent years, remote work has increased as an alternative to being present in the office, especially in software development companies. Despite the obvious advantages such as reduced travel time and spending more time with family, remote working is not easy. It requires personal skills such as self-managing skills, and a workspace that can support work is needed, along with a strong internet connection playing an essential role in the success of remote working [1] [2]. Dell Technologies in 2020 identified a case study of remote work readiness in Asia Pacific, showing that eight out of 10 employees are somewhat prepared to work remotely for the long term, with Indonesia ready to work remotely for the

long term [3]. Although based on *OOKLA* data the average internet speed in Indonesia is still below the standard compared to other countries, with an average internet speed of 26.9 Mbps [4].

In recent decades of software development, the emergence of Agile Scrum methodologies has changed how people view and do their work and how companies encourage their employees to behave [5]. According to the 15th Annual State of Agile report, Scrum is the most popular agile approach, with 66% of 1.382 survey respondents using the Scrum framework to develop software in their organizations. They like Scrum because it can divide complicated tasks into user stories and visualizes them on a workflow [6]. Moreover, the success rate of projects adopting Scrum is 60% higher than other projects adopting traditional approaches. In Indonesia, many software companies apply Scrum framework in developing their software because it is considered more effective and easy to implement [7]. However, many companies that adopt Scrum practices to a remote work environment face

ISSN: 1992-8645

www.jatit.org



E-ISSN: 1817-3195

different pressures and challenges as individuals and teams, such as indefinite working hours, incomplete or inadequate facilities, loss of motivation, lack of collaboration, and ineffective communication between teams [6] [7]. Therefore, this research seeks to address the following question:

What factors affect employee performance on development projects during remote working?

The primary objective of this study was to investigate the impact of remote working in the Scrum framework. The variables are obtained based on previous research on remote workers' employee performance as done in the recent study by [10], which shows how welfare and productivity changes can affect employee performance. Other studies [11] have considered that the virtual team's behaviour influences employee performance. Similarly, numerous other studies have attempted to explain the impact of remote working in agile scrum projects [12] [13] find that team capability and remote work environment influence the success of agile scrum projects. In addition, the authors also conducted interviews with colleagues about their experience working remotely by obtaining several influential factors, such as poor internet signal around their area, lousy work environment, lack of motivation, and foul mood during work. Other theories taken from the previous study will be included in section 2.

2. RELATED WORKS

The authors of this study conducted a literature review of employee performance models collected from previous research related to employee performance in scrum and remote work practices.

Following the hypothesis development in this research, the authors combine several factors that generally affect employee performance. Therefore, the research model of the hypothesis is grouped into two factors which are internal and external, as shown in **Figure 1**. Internal factors influence employee performance by individuals, and these factors do not depend on the team. Meanwhile, external factors influence employee performance by the team during remote working.



Figure 1. Research Model

2.1 Internal Factors to Employee Performance

Remote work can achieve a balance between work and personal life, more productive, time saving and more freedom. However, several studies have shown that the productivity and performance of employees in remote work depend on various behaviour and characteristic indicators in each individual.

It has been suggested that self-control and emotional stability affect employee performance in remote work. The higher the self-control and emotional stability level, the better employees' productivity at work [14] [10]. This finding is also supported by [9] that remote working is not easy and has several challenges, such as (distractions, ineffective communication, procrastination, and burnout), as well as four characteristics of virtual work that affect the experience of these challenges (social support, work autonomy, monitoring, and workload). Overall, these study has shown that individual self-control and emotional control are significant moderators in how employees complete their work tasks remotely. Furthermore, to conduct further analysis on the effect of Self Control, this research proposes the following hypothesis:

H1: Self Control has a significant positive effect on Employee Performance

Another study found that Work-Life Balance influences employee performance. Detailed examination of employee performance by [15]

ISSN:	1992-8645
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showed that work-life balance could provide more robust performance for the company. A healthy work-life balance makes it easier for employees to carry out their consignment duties more effectively and efficiently. The findings are in accordance with the research conducted by [16] in the Indonesian context, especially for employees who work from home, where the closer employees are to their families, the concept of work-life balance can be a positive sign, which in some areas can enhance job satisfaction to boost employee performance. Other studies have considered the relationship of individual employees to company policies [17], found that the influence of company policies in supporting employees to create an excellent worklife balance could improve employee performance. Furthermore, to conduct further analysis on the effect of Work-Life Balance on Employee Performance, this study proposes the following hypothesis:

H2: Work-Life Balance has a significant positive effect on Employee Performance

Most of the time, remote employees feel a high degree of flexibility. Employees can set their own rules where they do not have to get up too early to prepare for work and their daily commute. Employees can work while being close to their families or supervising their children. However, despite this incredible flexibility, one of the most significant challenges employees have to face while remote working is a lack of motivation. There is a growing concern that a lack of motivation is being disadvantaged during working remotely. Motivation is inspiring people to work in such a way as to produce their best results.

Staying motivated while remote working is just as important when in the office. Also, keeping from distractions is not easy when working remotely, and therefore, it is not always easy to be productive all the time, which is why staying motivated is essential. A study that set out to determine employee performance [18], found that the increase in employee motivation will also follow an increase in employee performance. This view is also supported by [19], who writes that the motivational correlation of status, retirement benefits, salary increment, recognition, and job security are positively related to employee performance. Furthermore, to conduct further analysis on the effect of Work Motivation, this research proposes the following hypothesis:

H3: Work Motivation has a significant positive effect on Employee Performance

Working from home is attractive to workers because it dramatically reduces travel, gives a better work-home balance, and less stress from being in the comfort of home. Some workers who work remotely usually have a home office to work. However, the home office must incorporate good ergonomic concepts to ensure the long-term health of the workers [20]. Professionals with more ergonomic home offices can significantly improve work productivity. A broader perspective has been adopted by [10], who argue that a better home office environment can significantly increase work productivity. Therefore employee performance is influenced by a home office environment that is safe, comfortable, and conducive to completing tasks in it.

Another problem when remote working is an internet connection. The impact of unstable internet connection can increase employee working hours, especially for employees who need to upload data via the internet and also on communications made during online meetings that are less than optimal due to unstable internet connection. Apart from that, IT employees who work remotely also need facilities that can help them to work, such as computers and laptops. However, with the case raised in this study being in Indonesia, it is known that not all regions have high-speed internet connection, as reported by [21] in 2020, revealing the inequality of internet access in several regions. Furthermore, to carry out analysis on the effect of the Work Environment on Employee Performance, the results of a short interview are also added to strengthen the hypothesis. Therefore, the following hypothesis:

H4: Work Environment has a significant positive effect on Employee Performance

Work Environment in a broad sense here means the extent to which the environment can support employees in their work, such as the facility in the workplace, disturbance in the home office, and the stability of the internet network in their area.

2.2 External Factors to Employee Performance

Generally, work in IT, especially in scrum software development, is usually done in a team. The factors found to influence employee performance have been explored in several studies. One of them is team capability. Not only being able

ISSN: 1992-8645	www.jatit.org	E-ISSN: 1817-3195

to complete small tasks but the company's big vision can also be achieved with solid and compact teamwork. Studies by [13] have shown the importance of team capability in the success of software development projects using agile methods. This factor also refers to utilizing knowledge and conditions that enable teams to complete their tasks successfully.

An investigation into team capability in a virtual team's performance by [11] found that trust and communication between team members significantly influence team performance. Traditionally, the ability of members to get along with one another is critical to task performance. Furthermore, to analyze the effect of thrust and communication on employee performance. A broader perspective has been adopted by [22], who argues that teamwork is the most significant independent variable impacting employee performance, followed by trust and effective leadership in the team. However, the positive relationship between communication, trust, and teamwork in team capability has been shown in numerous studies [23] [24] [25] [26], where these three things are the key to the relationship between team performance and team creativity. Therefore, research proposes the following hypothesis:

H5: Thrust has a significant positive effect on Employee Performance

H6: Communication has a significant positive effect on Employee Performance

H7: Teamwork has a significant positive effect on Employee Performance

3. RESEARCH METHODOLOGY

The methodological approach taken in this study is based on quantitative methods. This work takes the form of a case study of the performance of Scrum practitioners who work remotely in Indonesia. Structural model hypothetical variables were obtained from previous relevant studies and will be tested based on the questionnaire data.

The population in this study are employees who are practitioners of the Scrum method (Software Engineer / Developer, Quality Assurance, Scrum Master, Product Owner / Product Manager) and work remotely in Indonesia. The study was conducted in the form of a survey, with data being gathered via the online survey system Google Form and distributed to employee social media LinkedIn and online messenger WhatsApp.

This study utilizes a Likert Scale to collect study samples. It is used to measure attitudes, opinions, and perceptions of a person or group. On a metric scale, respondents were asked to rate their degree of agreement with the preceding assertions (items) from strongly disagree to strongly agree.

4. FINDING AND DISCUSSION

After receiving a total of 316 responses, the next step was to test the model using Structural Equation Modelling. It can estimate and test the causal relationship with statistical data and qualitative assumptions. Moreover, the analysis uses the Partial Least Square (PLS) method to test the relationship between variables.

4.1 Demographic

Most respondents are male (60%) and the most domicile locations are in Greater Jakarta (Jabodetabek) (58%). In addition, the roles of scrum practitioners are quite varied; most of them are software engineers (60%) and quality engineers (30%), followed by product owner and scrum master roles, with around (5%) and most practitioners using Google Meet (78%) for online meetings, Slack (96%) for group communication and Atlassian Jira (97%) tools to support Scrum techniques and practices.

4.2 Measurement Model

The model specification and parameter estimation process was carried out in the employee performance measurement model with validity and reliability testing. The purpose of validity testing is to measure Convergent Validity and Discriminant Validity. The results of Convergent Validity measurement are determined based on the value of the loading factor and average variance extract (AVE). The estimated factor loading is ideally 0.7 or higher, so the indicator can be valid to measure the variable [27]. For the AVE testing, the value on a variable must exceed 0.5, where the measured variable can be said to be valid. Therefore, this study only uses indicators with value loading higher than 0.70 and AVE higher than 0.5 to be satisfactory. However, if AVE is less than 0.5 but Composite Reliability (CR) is higher than 0.6, the convergent validity of the construct is still adequate [28]. Twelve indicators are removed in the testing of

Journal of Theoretical and Applied Information Technology

<u>31st December 2022. Vol.100. No 24</u> © 2022 Little Lion Scientific

ISSN: 1992-8645

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Convergent Validity because they have a loading factor value of less than 0.7, AVE value of less than 0.5, and CR higher than 0.6. Therefore, second testing was conducted as shown in **Table 1**, showing that all indicators are valid for Convergent Validity.

After Convergent Validity testing, the next step is Discriminant Validity testing. In the Discriminant Validity testing, the Fornell Larcker Criterion (FLC), Cross Loading, and Heterotrait-Monotrait Ratio (HTMT) value will be used to show the correlation value between a variable and another variable. In the FLC and Cross Loading testing, the correlation value of a variable against itself cannot be smaller than the correlation of that variable to other variables [29]. For the HTMT, if the values close to 1 indicate a lack of discriminant validity [30]. However, this model shows that all the testing results tell that the model is fulfilling the expected valid result in the Discriminant Validity measurement.

Reliability testing helps to see whether the hypothesis is reliable or suitable for the model. Reliability testing can be determined based on composite reliability and Cronbach's alpha values. Composite reliability does not assume equality between measures and believes the indicators have the same weight. Composite reliability is more concerned with individual reliability, referring to different external loads of indicator variables.

The upper bound for Composite Reliability should be the same as for other reliability measures, with a score of 0.6 to 0.7, which indicates adequate model reliability [28]. In addition, for the reliable variable of the model, the value of Cronbach's Alpha must exceed 0.6 to be acceptable [31]. Therefore, reliability testing was carried out and showed that all variables had Composite Reliability of higher than 0.7, and most of the variables had Cronbach's Alpha of more than 0.6 except variable SC, with less than 0.6. However, if the value of Cronbach's Alpha in the variable is higher than 0.5, it is still allowed but indicates poor reliability [32]. Therefore, because the validity and reliability test value for most indicator variables are acceptable, all these indicator variables in Table 1 can be declared valid and reliable to measure model hypothesis.

Table 1: Validity and Reliability Final Test Result					
Variable	Item	Loading Cronbac		CR	AVE
		Factor	h's Alpha		
SC	SC3	0.818	0.540	0.012	0.685
30	SC5	0.838	0.540	0.815	
WLB	WLB5	1.000	1.000	1.000	1.000
WIM	WM4	0.838	0.650	0.040	0.737
VV IVI	WM5	0.886	0.039	0.848	
	WE1	0.739			
WE	WE2	0.741	0.799	0.955	0.596
WE	WE3	0.744	0.788	0.855	
	WE5	0.829	1		
	TH1	0.729		0.872	0.577
	TH2	0.708			
TH	TH3	0.746	0.829		
	TH4	0.787			
	TH5	0.821	7		
	CM1	0.775		0.868	0.569
	CM2	0.705	1		
СМ	CM3	0.832	0.820		
	CM4	0.738]		
	CM5	0.716]		
	TW2	0.742			
TW	TW3	0.800	0.783	0.853	0.591
1 W	TW4	0.742			
	TW5	0.791	1		
	EP1	0.824			
	EP2	0.810]		
EP	EP3	0.839	0.884 0.913		0.677
	EP4	0.823			
	EP5	0.817			

4.3 Measurement Model

The structural model influencing employee performance is categorized into internal and external factors. In assessing the structural model, the P-value and Path Coefficient are used to conclude the causal relationship of the model. As shown in Figure 2, the employee performance variable has an R^2 value of 72.8%, with the structural model achieving a good fit (SRMR = 0.073, NFI = 0.714) [33].

The assumption or requirement in the inner least square partial model analysis is that there is no multicollinearity problem. We use the Variance Inflation Factor (VIF) test to evaluate collinearity. The result is that all VIF values are less than 5, meaning there is no indication of collinearity between constructs. Furthermore, to assess whether the hypothesis is accepted or not seen from the value of T-Statistics and p-value. A hypothesis is said to be accepted if the p-value < 0.05 and the T-Statistics > 1.96. This study uses model testing using the Bootstrapping algorithm with 5000 iterations.

Journal of Theoretical and Applied Information Technology

<u>31st December 2022. Vol.100. No 24</u> © 2022 Little Lion Scientific

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E-ISSN: 1817-3195

Table 2: Hypothesis Test Result							
Variable	Path Coefficient	Original Sample (O)	Sample Mean (M)	STDEV	T-Statistics	P-Values	Result
Self-Control (H1)	0.090	0.089	0.091	0.037	2.402	0.016	Significant
Work-Life Balance (H2)	0.012	0.159	0.156	0.048	3.323	0.001	Significant
Work Motivation (H3)	0.113	0.148	0.143	0.046	3.237	0.001	Significant
Work Environment (H4)	0.221	0.158	0.165	0.56	2.808	0.005	Significant
Trust (H5)	0.108	0.078	0.079	0.061	1.279	0.201	Insignificant
Communication (H6)	0.270	0.245	0.244	0.052	4.729	0.000	Significant
Teamwork (H7)	0.231	0.220	0.220	0.059	3.738	0.000	Significant

The model shows that all internal factors significantly affect employee positively and performance, as shown in Table 2. The model shows that Employee Performance is statistically positive and significantly explained by Self-Control (β = 0.090, p < .05), Work-Life Balance ($\beta = 0.012$, p < .01), Work Motivation ($\beta = 0.113$, p < .01), and Work Environment ($\beta = 0.221$, p < .01). Thus Hypothesis H1, H2, H3, and H4 are confirmed. However for the external factor, the model shows that Employee Performance is statistically positive and significantly explained by Communication ($\beta =$ 0.270, p < .01) and Teamwork ($\beta = 0.231$, p < .01), not by Trust ($\beta = 0.108$, p > .05). Thus both Hypothesis H6 and H7 are confirmed whereas H5 is rejected. However, based on the external factor result, it has been unable to demonstrate that trust significantly impacts team performance based on several studies [11] [23].

ISSN: 1992-8645



Figure 2: Measurement Model

4.4 Managerial Implication

The results of this study indicate that employee performance is influenced by individual and team factors. Individual factors such as selfcontrol are because when employees engage in unfair behaviour or even conflict experience disrespect, it can reduce their self-control. The result is a decrease in employee performance, as they will try to minimize involvement with work tasks, cooperate with others, and refrain from abusive or deviant behaviour [34]. In this case, the management's decision to improve self-control, such as adjusting work rules and providing supervision in the form of complaints, plays an essential role in overcoming this. In addition, the effect of self-control is also related to work motivation.

Work motivation has emphasized peoplebased factors, for example, mastery and needs for autonomy, and situation-based aspects, for example, job characteristics and incentives, which explain the differences between people in employee actions' direction, intensity, and persistence [35]. In this case, the company's role in increasing its motivation is to try to identify affective and cognitive processes that integrate input from people (e.g., needs and motives) and the environment (e.g., norms and feedback) to form goals and plans that enable people to organize their influence, attention, and behaviour.

Motivation during work is also related to work-life balance and the workplace. Achieving a work-life balance has proven essential for mental and physical health [37] [38]. Therefore, companies must improve their work-life balance by providing flexible working hours to reduce work overtime, improve health and fitness, the proper work task, and provide support for employee families to improve their performance. Furthermore, as home offices are becoming a permanent choice for many workers, companies need to provide suitable accommodations for their work environment, such as desks and chairs, to make their workspaces more ergonomically ISSN: 1992-8645

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comfortable, reduce pain [38], and provide facilities such as monitors, mice, and keyboards to increase their productivity [10].

As for the influence of the team (external) on employee performance is directly influenced by Communication and Teamwork between teams. Scrum practice ceremonies, such as the Daily Scrum, Sprint Review, and Sprint Retrospective, are always places of communication and teamwork between the scrum team. Scrum practice always demands transparency in the assignment of tasks and progress based on the work program.

According to our findings, the implications of working remotely where the Scrum team does not meet physically can be replaced or assisted by providing an online meeting platform facility with the sophistication of metaverse technology. The metaverse is a post-reality universe, and users can meet face-to-face virtually. This technology combines Virtual Reality (VR) and Augmented Reality (AR) technology that can embody physical reality with digital virtuality [39]. It can help individuals in establishing a closeness between teams in communicating and collaborating while working remotely. However, it is certainly more expensive for companies to provide these facilities as platforms that offer virtual communication and collaboration in video conferencing. Because generally, in choosing a communication and collaboration platform, virtual teams need features such as video, audio, share screens, written text, and voting to create effective collaborative communication [40]. As found in this study, 78% of the 316 respondents chose Google Meet as a platform to help with virtual communication and collaboration, followed by Zoom. Another thing that companies can help with is providing facilities such as microphones, headphones, or webcams to assist employees in collaborative communication in teams.

Implementing telework in Scrum practices is an option to strengthen individuals who are determined to work flexibly. The decision to implement telework is usually triggered by time flexibility in doing several tasks and being close to family. Finally, this research assists the general reader in gaining information and understanding about the performance determinants and processes in scrum practice development projects.

5. LIMITATION AND FURTHER RESEARCH

There are some limitations to this study. First, we recognize in this study that it still lacks a specific context on the working arrangement of employees. Employees are not constrained by information about whether they had worked from office before or, from the start, they worked remotely. As it happens, those who previously worked remotely were required to work in the office or vice versa. However, this is quite interesting to be developed into further research to examine employee behaviour and work culture related to the changes in the working arrangement. The second limitation is that the determinants of employee performance used in this study can only able to meet 72% of employee performance perceptions, which needs further development for further research.

Lastly, this study was conducted in one country (Indonesia), limiting the characteristics and influences of the employee environment. Future studies to collect data from various work cultures and additional variables will strengthen the discovery element of employee performance in the scope of software development working remotely.

6. CONCLUSION

This study intends to highlight the effect of remote working in Scrum practices on employee performance by applying PLS-SEM analysis using SmartPLS on 316 Scrum practitioners, including inner and outer model testing.

The study results concluded that the performance of scrum employees who work remotely is influenced by individual and team factors. Individual factors include self-control. work-life balance, work motivation, and work environment with work-life balance and work motivation have the most significant influence. Team factors include communication and teamwork. Moreover, the model result shows that team influence is more significant than individual influence. The most significant impact is communication and teamwork. This means that companies need to help maintain team communication and collaboration, such as providing facilities to maintain and improve their employees performance. However, the trust factor was insignificant. It indicates that most Scrum team members can complete their tasks independently. It makes sense that the more you can work on your

Journal of Theoretical and Applied Information Technology

ISSN: 1992-8645	www.jatit.org	E-ISSN: 1817-3195

own and make your own decisions, the less you need to trust others to succeed.

Finally, this paper offers information related to the factors that affect employee performance and how companies that implement remote work in software development projects can assist their employees in maintaining and improving their performance.

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Journal of Theoretical and Applied Information Technology <u>31st December 2022. Vol.100. No 24</u> © 2022 Little Lion Scientific



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E-ISSN: 1817-3195

ISSN: 1992-8645

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Construct	Code	Items	Reference
Self-Control SC1		I can get frustrated easily when working	[41]
	SC2	I've been dealing with work problems well	[42]
	SC3	I can think clearly during work	[42]
	SC4	I felt in control of my work	[43]
	SC5	I'm good at resisting temptation to stay focused when working	[44]
Work Life	WLB1	The number of hours I work is in accordance with the agreement determined	[45]
Balance		by the company from the start	L - J
	WLB2	I work in an environment that is supportive of my family and personal	[45]
		commitments	
	WLB3	My job doesn't require me to work after hours to complete my routine tasks	[45]
	WLB4	The demands arising from my work do not stress my personal life	[45]
	WLB5	I often feel sleep-starved due to the amount of work that I have to finish	[45]
Work	WM1	I am engaged and interested in my daily work activities	[46]
Motivation	WM2	It's hard to get in the mood when working	[41]
	WM3	I felt close and connected with other people who are important to me during	[47]
		working	[]
	WM4	I get excited and enjoy my work time	[48]
	WM5	I feel motivated to work as hard as I can	[48]
Work	WE1	I work away from excessive outside noise	[49]
Environment W	WE2	I have the equipment to make me comfortable when working (eg: Chair.	[49]
		Table. etc)	[]
	WE3	I have sufficient technical equipment to do my job (eg: PC or lapton.	[49]
		headset, webcam, microphone)	[]
	WE4	I am able to cope with poor or inadequate internet connection during work	[49]
	WE5	My workstation offers an environment where I can easily focus on my work	[49]
Trust	TH1	There is respect for individuals in my team	[50]
	TH2	The communications from my team members are mature and professional	[50]
	TH3	People in this team are willing to share knowledge/ideas with others in this	[50]
		team	[- •]
	TH4	My team members will be honest in describing their experience and abilities	[50]
	TH5	Members of our team trust each other	[50]
Communication	CM1	During work I feel the information received is good	[51]
	CM2	I have the information I need to do my job	[51]
	CM3	Overall. I feel that the communication that occurs between team members	[51]
	01110	and the organization is appropriate	[01]
	CM4	The information that I receive from my supervisor is consistent with the	[51]
		information received from other supervisors	[01]
	CM5	I can communicate well with other team members and team members during	[51]
		work	[]
Teamwork	TW1	I integrate my ideas with my team to come up with joint decisions	[52]
	TW2	investigate an issue with my team to find an acceptable solution	[52]
	TW3	We do pairing or sharing sessions to meet the needs in team knowledge	[52]
	TW4	We work together to improve the team's ability to solve problems that exist	[52]
	• • •	in the future (Sprint Retrospective Activity)	
	TW5	Work is done as a team and coordination among each member is appropriate	[52]
Employee	EP1	I was able to fulfil my responsibilities	[53]
Performance	EP2	My collaboration with other people is going as desired	[53]
	ED2	Communication with others lad to the desired result	[53]

I take the initiative to start a new task myself, when my previous task is

I am able to cope with difficult situations and performance setbacks at work

EP4

EP5

finished