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Workspace layouts for communication quality in Scrum teams

Kholid Haryono¹, Za Idatin Nikmah²

Informatics Department, Faculty of Industrial Technology, Universitas Islam Indonesia, Jl. Kaliurang KM. 14.5 Sleman Yogyakarta Indonesia

¹Corresponding author: kholid.haryono@uii.ac.id

Abstract. Purpose of study to show the influence of workspace design on the quality of communication, especially on the Scrum team. The motivation is to find out the effect of changes in layout of the workspace on the quality of communication. Communication quality is an important concern about the performance of software development in the Scrum team. Problem: How does the layout change affect the Scrum team's workspace on the quality of communication between members on a team; team members with other teams, and differences in the effect of changing layouts with old layouts. Methodology: Research steps use Participatory Action Research (PAR). This method has four main steps, namely planning; acting; observing; and reflecting. Data retrieval uses survey method by distributing questionnaires, conducting daily observations, and Forum Group Discussion (FGD). Findings: The Development Team Cell (DTC) workspace model is better than the Conference Cell (CC) model. This finding strengthens the previous research conducted by Scott and Pawel Role. Conclusion: There are three conclusions. a) changes in layout can improve the quality of individual communication. b) changes in layout have a positive effect on the quality of communication between team members and outside parties. c) changes in layout have a positive effect on team members' understanding of the work and methods used.

1. Introduction

Effective communication is one of the keys to success on the Scrum team [1][2]. Scrum is a product-oriented project management approach. This approach emphasizes product release rather than development documents [3], so that communication between members in the team will be more intensive than communication with project planning documents. Many project failures are caused by poor quality communication. The most frequent failure is due to incompatibility between requirements and results. In addition, the software delivered is outdated, and it is not in accordance with the needs of stakeholders.

Scott W Ambler, in 2002-2005 explained about the most effective communication model, namely face to face with whiteboard, face to face conversation, video conversation, and phone conversation [1]. These communication models can be applied one way by redesigning the development team's work space. The principles expressed by Scott are important considerations in developing them. Workspace design for this team can improve the communication quality of team members both internally and externally [4]. Workspace barriers that are set improperly can hinder team performance. Performance that does not match expectations both from results and processes has become a clear consequence of communication barriers in the team.

Purpose of this study will show the influence of workspace design on the quality of communication, especially on the Scrum team. Case studies were taken from the journey of the Information Systems Agency (BSI) at a higher education institution in Indonesia. BSI is the unit responsible for the development and service of information technology and systems. They are



overhauling the technology to adjust to current needs. As a unit that is trying to rebuild its information system after the old system is declared out of date, the number of systems to be rebuilt, and the large number of teams, BSI adopts the Scrum approach. This approach was chosen because it has been proven to be able to develop software in an agile and effective manner [5][6][7][3].

One of the problems encountered in the initial stages is the difficulty in integrating the work of each team members. From the seven teams that were formed often found miscommunication and had not cooperated well. Even each members of team also could not cooperate with other members, so that they complete their own work. This study will examine the results of research conducted by Pawel Rola about workspace that can improve the quality of communication in teams by implementing the design at BSI. The contribution of this research provides more important lessons and findings of information that are useful for business people, especially organizations that use the Scrum approach.

2. Previous research

There have been several previous studies related to work space and communication quality on development teams that use the Agile (Scrum) methodology. Some of them are:

Pawel Rola (2016) examines the concept of a workspace model for the Scrum team. The purpose of this study is to provide support to the project team so that they are able to complete the mission effectively. The results of this study indicate that changes in workspace design have a positive effect on the performance of the Scrum team. There are at least three effects achieved, namely (a) a good workspace can maintain the team to continue to improve work in accordance with the Scrum framework; (b) change workspace to improve team performance; and (c) the attention of team members increases especially to leaders, Agile trainers, and co-workers who work in teams [4].

Betteke Van Ruler (2014) examined the effectiveness of Scrum team communication in the public sector. The case study was carried out in the Netherlands. The results of the study indicate that the involvement of communication theory is still needed to support effective communication, especially with external parties [2]. Nils BredeMoe, et al (2010) examined the team model to improve understanding of the Agile (Scrum) method. The aim is to provide an understanding of the agility of small teams in managing themselves. In addition, it also shows the challenges faced by the team in the Scrum project. They find problems in team orientation, team leadership, and coordination. Furthermore, highly specialized skills and appropriate job sharing are important obstacles to achieving team effectiveness. [6].

Based on these studies, the position of this study will take the results of Pawel Rola (2016) about the layout he offered. The design of the recommendations will be implemented at BSI. The effect will be measured by asking feedback from team members regarding the changes. At BSI, testing was carried out at the development unit. The method used is Participatory Action Research (PAR) with college case studies. This is important because the cultural complexity in universities also influences team performance. The involvement of the team and all stakeholders in designing work, communication, and achieving development goals requires good collaboration as required by the Agile Manifesto [3].

3. Research Methodology

This study will test the quality of communication from the workspace design team implementation using the Scrum approach. Measurements are made before and after design changes. Before the change in layout will be revealed the initial conditions, both physical layout and communication conditions of team members. This communication includes internal, communication with other team members, and with external parties. The implementation stages of workspace change use the Participatory Action Research (PAR) approach [8]. There are four steps in PAR approach : Planning, Acting, Observing, and Reflecting. All of step will discuss in the bellow.

Analysis of the initial conditions and implementation of PAR was carried out with three main methods, namely Forum Group Discussion (FGD), observation, and questionnaire. The FGD was conducted by five people, namely three field heads and two development team managers. Observation is used to observe teamwork by sitting together when the team activities while recording the events that caused miscommunication. While the questionnaire to get the team members' responses about two

things. First, does the design change have a positive effect on improving the quality of communication? and second what influences the quality of communication in addition to workspace design.

3.1. Initial Conditions

This section shows the initial conditions of BSI before doing the workspace design and adopting the Scrum approach. This is important to provide convenience in understanding the results of this study. Initial conditions include initial layout design, team managerial approach used, and team conditions.

The initial condition of workspace has three forms. First, the closed cubicle cell (CCC) model. This model provides more privacy to team members. Second, open cubicle cell (OCC). This model is used by teams from third parties on duty at BSI. They are students who are in the final project, contract employees, and apprentices. Third, the conference cell (CC) model with a table in the middle and participants in a circular shape. These workspace forms are shown in Figure 1



Figure 1. Initial condition workspace

Management approaches are still conventional. Organizations use command or structural systems with clear job descriptions. Structurally there are five divisions. Namely, the planning division, development division, operational division, service division, and the Administration and Project Management (AMP) division. The total number of members is 42 people. The division with the most members is the development division which is 18 people and the operational division is 15 people. They consist of engineers (development, DB, QA, Devop, Network, and Security), Customer Support, and administration. One characteristic of a conventional approach is giving a clear job description to team members. This can close the creativity of each member, because they are working on something as assigned.

This research we focused for team who involved in the development process directly. Therefore, total of members who we got to be respondent from all members of development and part of members in the operation division. Total respondents are 18 from members of development division and others are members of operation division dan service division. So, total respondent are 21-23.

In early 2017, BSI adopted the Agile approach, Scrum. This method has proven effective in organizing employees, especially in the software development environment [7]. Among the steps in this approach is to build a smaller team, consisting of 5-9 people per team [3]. The formation of the team was successfully carried out with the composition in the development division and operating division with the most members. The development division was formed into 4 teams and operational divisions were formed by 3 teams. In fact, communication is still not optimal. One reason is the position of the workplace that uses closed cubicles so that privacy still dominates each member. Initial attempts to put the team in the meeting room, the results were good enough even though there were still some miscommunications in several places.

3.2. Participatory Action Research

This stage implements the workspace design to see the effect on the quality of communication for each member. The approach taken is Participatory Action Research (PAR) [8]. Workspace implementation starts from planning to reflecting results taken from the conditions after implementation. The steps include four stages: Planning → Acting → Observing → Reflecting.

3.2.1. Planning.

This stage is a crucial part because it will affect the validity and quality of research. At this stage includes several steps. First, look for an ideal workspace design for the Scrum team based on previous research. Second, look for workspace designs from best practices that have been used by organizations that apply the same approach.

Based on literature study and review of previous research, researchers found articles published by Pawel Rola [4] about workspace designs that are most suitable to be implemented. At least inspired by the five main forms of work space, namely conference cell, social kitchen cell, chill out cell, development team cell, and product owner cell.

Workspace design, especially seating composition, is a concern for the Scrum team. The need to improve team communication is to bring distance between members, even though they have to sit back and forth. This is shown in the design of the Team Development Cell workspace. The product owner's space is close to the team for intensive inspection needs. Social cells are useful for teams to brainstorm and gather ideas. Conference cells can be used for releases and meetings with stakeholders.

Workspace reviews from the best practices that used by startup companies and also using the agile-Scrum approach include Kudo Technology Indonesia. The main form of workspace is made together in a large space with a table and chair arrangement like a conference room. The principle of laptops were facing outwards with chairs close together as a way of bringing communication closer between team members and the ease of management in carrying out inspections of the course of teamwork. Stay supported with chill space, social room, and even a refreshing place and ping pong table. A similar workspace design is used by Agate Studio. This company is one of the game development companies in Indonesia located in Bandung.

3.2.2. Acting.

The workspace model that supports the quality of good communication in the Scrum team in the planning phase is Development Team Cell (DTC). In this acting phase. The focus at this stage is to change the form of two existing conference cells to DTCs. The first step is to ensure that all teams have space permanently because it will be used to store all notes on the blackboard and note board. The space provided is 4 spaces for four teams. Called teams 1, 2, 3, and 4. After implementation of space, the form of workspace used is shown in Figure 2.

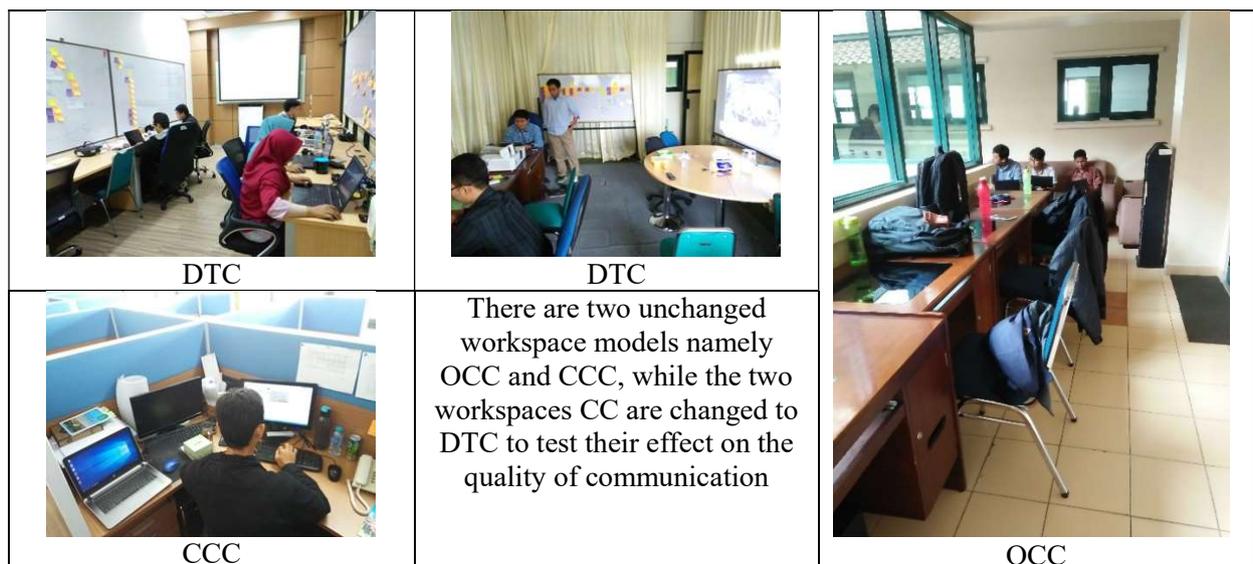


Figure 2. Workspace design after changes

In principle, the layout of seats is physically close to a position that facilitates team members in communicating with each member. The member's computer screen is facing out to facilitate discussion of various issues.

3.2.3. Observe.

This stage is used to retrieve data from workspace changes. Some of the activities carried out were: conducting daily observations, holding meetings (FGD) with management at the operational level held every week, and distributing questionnaires to team members to confirm what they felt after the implementation of the layout design.

Daily observations focus on several behaviors. That is, a) communication behavior of members in one team; b) mobility / movement of people to approach each other because of communication needs; and c) ease of communication between members of a team and other team members. Using the role of the product owner and Scrum master coordinator, this observation shows positive results. Among the space design models that produce the most effective behavior in communication is the model development team. This model allows the mobility of someone who is quite agile, especially supported by a blackboard as a means of communication.

The FGD was conducted with two division heads namely the planning division and development division and involved two managers. The FGD was conducted in conjunction with regular meetings conducted by operational management at BSI. This meeting is usually used for evaluating information system development process. Some notes summarized from several FGDs regarding the implementation of workspace changes include: a) workspace changes can improve the quality of communication between members in one team and between teams; b) the new layout of workspace has provided convenience in carrying out Scrum events such as sprint planning and daily Scrum; c) there are still some problems in communication but not related to the workspace, first, the problem of maturity adoption of the young Scrum approach. second, changes in team members are too fast. During the implementation of workspace changes, team members have changed twice. In fact, this change causes the quality of communication between members to decline.

The feedback from the team was carried out through questionnaires. Team members were asked to provide an assessment of a layout they had felt before and after the change. There are four layout models assessed, namely: conference cell (CC); development team cell (DTC); open cubicle cell (OCC); and covered cubicle cell (CCC). Each form of layout was submitted 16 questions. The weighting of each statement uses a Likert scale that is between 1 and 5. This method is also used in the CMMI method [9]. High scores indicate more significant. The results of the assessment are shown in Table 1.

Table 1. Results of respondents' assessment

No	Question Is ...?	CC		DTC		OCC		CCC		Max Score
		R	S	R	S	R	S	R	S	
Q1	The Layouts make communication between team members effective	23	4.39	23	3.87	22	2.36	22	1.64	4.39
Q2	The layout supports mobility of team members	23	3.65	23	4.22	22	2.91	22	1.68	4.22
Q3	The availability of the blackboard and its position	23	4.30	23	3.87	22	1.95	22	1.45	4.30
Q4	The position of the LCD screen is very appropriate for coordination	23	4.52	23	3.96	22	1.36	22	1.32	4.52
Q5	The layouts support communication with PO, SM, and Stakeholders	23	4.04	23	3.39	21	2.10	22	1.45	4.04
Q6	The layout supports communication with other teams	23	3.43	23	3.61	22	2.27	22	1.50	3.61
Q7	Seating position is appropriate	23	3.65	23	3.57	22	2.36	22	2.05	3.65
Q8	The availability of the road to pass through is adequate	23	2.74	23	4.17	22	2.91	22	2.36	4.17
Q9	The space area for the daily Scrum is fulfilled	23	3.17	23	4.00	22	2.23	22	1.59	4.00
Q10	The space area for review and retrospection is sufficient	23	3.74	23	3.78	22	1.95	22	1.55	3.78
Q11	The layout supports videoconferencing activities	23	4.17	23	3.65	22	2.18	22	2.41	4.17
Q12	The layout supports telephone conversation	23	3.70	23	3.61	22	2.23	22	2.77	3.70
Q13	The layout supports online/chat conversation	23	4.00	23	3.70	22	2.64	22	2.86	4.00
Q14	The layout supports overview document	23	4.04	23	3.61	22	2.18	22	2.09	4.04
Q15	The layout supports video recording	23	3.65	23	3.57	22	2.36	22	2.59	3.65
Q16	The layout supports audio recording	23	3.70	23	3.57	22	2.27	22	2.73	3.70

Some of the questions in Table 1 are taken from Scott Ambler, owner of Agile Modeling [1]. In each column the layout model (CC, DTC, OCC, and CCC) consists of two columns. Column R (Respondent) is the number of respondents who fill. Column S (Score) is an assessment score. The score is calculated by multiplying the number of respondents and the weight of the score divided by the number of questions so the results are in the range of 1 to 5. For example, the data in the CC layout model contains 23 respondents with a score of 4.39, numerical calculations are shown in Table 2.

Table 2. Calculation of scores for one of the questions in the Conference Cell model

No	High numbers are increasingly significant	Conference Cell					Number of Respondents' Answers
		1	2	3	4	5	
	<i>Significance weight</i>						
1	The Layouts make communication between team members effective	0	0	2	10	11	23
	Total number of answers * weight	0	0	6	40	55	101
	Score = (number of answers * weight) / total answers						4.39

Calculation of scores for all items in each layout model in Table 1 uses the same method.

3.2.4. Reflecting.

The activity of this section focuses on the reflection of each individual team member; reflection of personal relationships with team members; and structural reflection which includes an individual's understanding of the subject under study [8]. All three were analyzed between before and after the change in layout so that conclusions could be drawn. Table 1 column of the CC model is the layout before the change, while the DTC model after the change. Other models, the CCC and OCC models are not discussed because of the old layout and only show that the two models are not good for Scrum team communication. This is indicated by the small score of the two models.

First, reflection is felt and observed in each individual. Table 1 shows Q2 (seat mobility), Q3 (screen or whiteboard position with seating), and Q7 (seat position). CC scores are greater than DTC in Q3 and Q7 with a difference in scores of 0.43 and 0.09, while the Q2 is greater in DTC with a difference in the score higher than 0.57. This indicates that the influence of individuals on the quality of communication has no effect before and after change. It is only 0.01 bigger than DTC.

Second, a reflection of the relationship between members is shown in Q1 (communication between team members), Q6 (communication with other teams), and Q7 (availability of space for roads). CC score is greater than DTC in Q1 with a difference in score of 0.52, while Q6 and Q7 are greater in DTC with differences in scores of 0.17 and 1.43. This indicates that the effect of the layout on communication between members and between teams has a positive effect with a difference of 0.36 greater DTC.

Third, structural reflection of individual understanding of layout is shown in Q4 (communication to LCD position), Q5 (supports communication with PO, SM, and stakeholders), Q9 (space area for daily Scrum), and Q10 (space area for review). CC scores are greater than DTC in Q4 and Q5 with differences in scores of 0.57 and 0.65, respectively. Whereas Q9 and Q10 are larger DTC with a difference in scores of 0.83 and 0.04. This indicates that the effect of layouts on members' understanding of workspace changes is better before being changed by a total difference of 0.09.

4. Finding

Findings from testing the effect of the implementation of workspace design in improving communication of the Scrum team stated that the CC and DTC models occupy the highest position. This reinforces the publication by Scott [1] This reinforcement the publication by Scott that face to face with a whiteboard is the most effective way of communication. DTC in this study previously came from the design of the conference model workspace. The findings that can be drawn from the analysis of the field data are shown in Figure 3.

DTC as a space that was changed from the CC model and tested in this study shows a positive influence on the quality of communication on the Scrum team. At least the influence occurs in Q2, Q6, Q8, Q9, and Q10. These five attributes are the core of the Scrum team's main activity so that the DTC layout model can be recommended as an ideal layout to improve the communication of Scrum team members.

5. Conclusion

After testing the changes in the workspace model on the Scrum team and observing the effect on the quality of the communication that occurred, several notes can be drawn that conclude in this paper. a) changes in layout can improve the quality of individual communication. b) changes in layout have a positive effect on the quality of communication between team members and outside parties. These

parties include PO, SM, and stakeholders, and c) changes in layout have a positive effect on team members' understanding of the work and methods used.

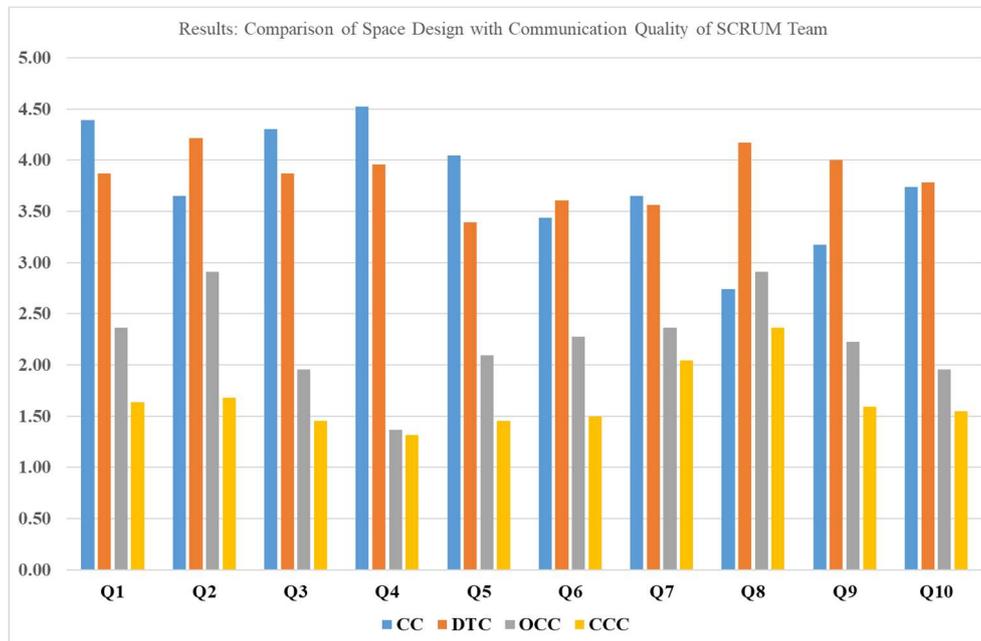


Figure 3. Comparison of Space Design with Communication Quality of Scrum team

6. Future Work

Research opportunities related to effective communication in Scrum implementation are still broad. Especially about workspace and layout for management team in Scrum approach. Future research can attempt to propose about effective collaboration in the team Scrum related workspace. This issue is significant which collaboration be more important to achieve development successfully.

In addition to workspace, an important issue that can be developed is the communication design that is influenced by the type of leader, the adoption of the method that is half-way (as best as possible), the change of the team in the middle of the road, and the main psychological aspects of team happiness. Happiness is an important issue because it affects performance and productivity. Not all happiness is judged from the material. It can also be seen from the point of view: feeling safe, comfortable, and positioned as an important person in the team.

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