A Study of Relations between Office Layout and Communications

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Abstract. The aim of this study is to define the indexes to evaluate the activating communications in the office space and to find the relations between office layout and communications. At first, the authors have defined ten evaluation indexes through a research for the office layout trend and a case study. And then, an experiment to compare two different offices was carried out. The authors focus on "quantity" and "diversity" of communications so that the activating communications is evaluated quantitatively. The relations between office layout and communication took place in the office was discussed with the result of the experiment in our conclusion.

Keywords. Office layout, Collaboration, Workplace, Communication, Office survey

Introduction

The substance of the job is unpredictable, and unknown factors must be investigated in knowledge society. It is necessary for new knowledge and abilities to be combined, for collaboration with other fields to increase, and for work to be done while rushing about the city. Information and Communication Technology (ICT) enables people to work at out side of the office space such as at the airport, in a train, in a café; in any city place. In fact, many workers carry out their jobs and communicate with the mobile phones and mobile PC's.

On the other hand, a key requirement for the physical office space is "workplace for groups" in order to maximize the knowledge productivity of a company. The workers select better places in the office to work in accordance with a project phase or their requirements, which is similar that people choose the space to fulfill their object in a city. Consequently, a work-style for office workers has been changing and some new types of physical workplace have been proposed. Non-territorial offices and Satellite offices are some notable examples. Although the communication gets diversity including telecommunications such as e-mails and teleconferences, the conversation in the physical office space get less than before due to distribution of workers. In order to support the group work in office, both formally and informally communications took place in the office need to be promoted.

The aim of this study is to define the indexes to evaluate the activating communication and to find the relations between office layout and communications. The authors focus on "quantity" and "diversity" of communications so that the activating communication is evaluated quantitatively. The ten evaluation indexes are defined as the diversity of communications based on the result of an office layout trend research and a case study. And then the relationship between office layout and the activating communication is discussed through an experiment that compares a common office layout in Japan with an office layout that aims to activate communications.

1. Research for the office layout trend

In order to investigate planning factors of layout for the activating communication, the authors took 131 cases of advanced offices. These 131 cases were collected between 2001 to 2005 from the "Nikkei new Office Award" which was organized by the "New Office Promotion Association" in Japan. There is an evaluation item in the report to the award, which is "a planning for the activating communication in the office space". The authors collected comments and concepts in this evaluation item from the reported sheets to the "Nikkei New Office Award". In the result of this survey, the characteristics of planning factors are divided by four levels of office space and listed as table. 1.

The number of cases applied in "the planning for the activating communication" is counted for each level in order to examine the tendency of office layouts. The "layout rate" in Fig. 1 is calculated so that the number of cases applied in "the planning for the activating communication" is divided by the total number of cases in each year. As a result, the layout rate of both the room level and work-station level increased year after year comparing with the rate of floor level and building level. This may indicate the importance of the activating communication on the room level and work-station level due to many open space offices that exist in Japan into consideration.

Table 1. The layout factors to aim the activating communications

Space levels	Layout factors
Building level	- Voids in buildings by which worker can be aware of other floors' activities. - An atrium where workers communicate casually with professionals out of company.
Floor level	- Open floor that is able to glance round the office space.
Room level	- A refresh place is adjoined in a office - Centralized utility space for copy machines, fax machines, stationeries, etc. - A meeting space that is opened casually.
Work-station level	- Low partitions between desks. - A wide desk that several people can join in.

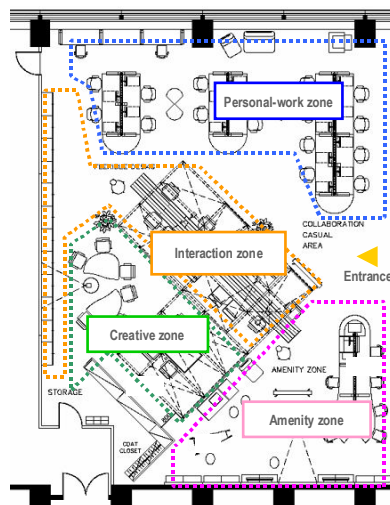**Figure 1.** The office layout trend

2. The case study

Figure 2. The case study office

Due to the result of the research for the office layout trend, an office which is designed to activate worker's communication with the room level and the workstation level was selected to do a case study. The office planned as an office where specialists and professionals from different organizations in a company occupied. The number of workers who own their personal desks and chairs were 19. The area of this office space is 254[m^2]. It is shown in Fig. 2 that there were four-zones planned in this office. 1) A personal-work

zone where a person works at a personal space on his/her own desk and chair. 2) An interaction zone where there is no function, but a place to activate workers communication. There is a table 9 meters long and two different types of chairs surrounding communication tools such as projectors, white-boards, etc. 3) A creation zone where there is an enhanced meeting room with ICT tools. And 4) An amenity zone for relaxation and refreshment, facilitated with different types of chairs and a table of a different height.

The authors focused on the communication that took place in this office in order to find out the worker's activities that relate to the layout factors. The research at the office was examined for five days (from the 29th of Aug. 2004 to the 3rd of Sept. 2004). A field observation, self-photography research [7], and interview survey were carried out.

All conversations that took place in this office were observed in a sheet by two observers and also recoded on the video. The conversations were examined with attributions of when, who, and where communication occurred. The contents of a communication tried to be recorded with the interview to the worker whenever the conversation was finished. The communication that examined in the field survey was compared with the result of self-photography research in order to discuss which activities are able to activate worker's communication and what kind of conversations are important to progress their work. The authors have carefully selected the sixteen activities that suppose to evaluate the activation of the communication in the office. (Table. 2)

Table 2. The ten-evaluation indexes

Name of evaluation indexes	Short description
1. Exchange between diverse specialists	A worker from other groups comes into the office and communicates each other.
2. Action to write in	Recording the proceeding while meeting take place
3. Meta-discussion	Discussing a project proceeding before a meeting start.
4. Reflect on the meeting	Discussing a result of the meeting after a group-work finish.
5. Information sharing	Using information sharing applications positively.
6. Communications over the territories	Communicating to a worker at far side over the territories and zones.
7. Action to wander in the office	Making approaches to a worker while wandering in the office.
8. Ad hoc communications	Communications occurs incidentally.
9. Join in group-work	A person joins in the middle of a group-work.
10. Migration of group-work	Communications take place in different spaces.
11. A change of pace	Action for a change of pace during work
12. Look over the space	Looking over the neighbors to survey other workers and situation in the office.
13. A casual meeting	Meeting in casual style and place

14. Meeting at many places	Bringing ad hoc communication to a work level as a meeting at any where in office
15.Stumble across upon a clue	Try to grasp a situation to stumble across upon a clue.
16. Break into a conversation	Try to be interested in other workers communication, and cut into their conversation in order to inform his/her idea or opinion.

3. Relations between office layout and communications

3.1 A summary of the experiment

In order to find the relations between the office layout and communication, an experiment was carried out. Two different office layouts; 1. The common office layout plan and 2. The activating communications office layout plan, were set up and compared quantitatively the communication took place in each office space.

The experiment has been carried out for four days with a group of seven examinees include three of the graduated students, one of the forth grade students, and three of the third grade students who belong to the space design laboratory at Kyoto Institute of Technology. The examinees were given a design subject in group work for two days. The experiments have done twice with the different design subjects in the common office layout for the first two days (19th and 20th of Dec. 2005) and in the activating communications office layout for the other two days (26th and 27th of Dec. 2005).

The authors have recorded all conversations took place in these offices during the experiment. In the analysis, the communications are compared between the common office layout and the activating communication office layout quantitatively

3.2 Two office layouts for the experiment.

The characteristics of the two different office layouts ; 1. The common office layout plan and 2. The activating communications office layout plan, are described as below.

- *The common office layout plan (Fig. 3)*
    Two functional zones for personal work and group work are planned and divided by a fixed wall temporally in the office space. The 1100[mm] height of partitions are installed between individual desks. A refresh area is prepared at out of the office as same as the office layout plan in Japan.

- *The activating communications office layout plan (Fig. 4)*
    Three functional zones; a personal work zone, a group work zone and a refresh zone, are set up in the activating communication office layout plan. The office is an open office which has no partitions and no walls. A long table to urge examines work in the non-territorial space is prepared in the personal work zone. The utilities such as a printer machine, stationeries, a sofa, and a coffee service are set in the refresh zone. All these are planned based on the factors which is extracted from the office layout trend survey.
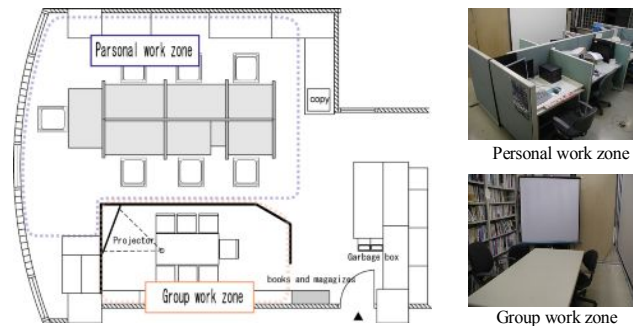
Figure 3. The common office layout plan

Figure 4. The activating communications office layout plan

3.3 Way to count communications

The authors created the data sheets and defined "Communication IDs" and "Communication scenes" as units to count the number of times communication occurred in the office. The definition is listed below.

- *Communication IDs*

The number of conversations was divided by topics of the conversation. For example, both short conversations at the personal work zone and long meetings at the group work zone are counted as one communication ID, because both have one topic for each.

- *Communication scenes*

The number of conversations was separated when either a tool, place or a person was changed. For example, if the conversation starts at a personal desk and then moves to the group work zone to communicate particularity about the same topic, this conversation is counted up to two communication scenes due to the change of place and one communication ID because of the same topic. Additionally, if they used a projector to share their digital information with this topic at the same zone, the communication should be

counted as three communication scenes due to the tool used and one communication ID because of the same topic.

3.4 Ten evaluation indexes

The authors selected ten activities (No.1 to No.10 in table. 2) from the sixteen activities in the case study result. The reason we selected it is to simplify the evaluation index and to have the field observation carried out without bothering workers of the examinee. Some of the sixteen activities are necessary to interview workers in order to investigate the contents of the conversation during the examination.

The idea to use these ten activities as an evaluation index is to examine the "diversity" of communication. The number of each ten activities are observed in the field survey and counted with an attribution of the "where it occurred" so that the communication took place in these offices can be evaluated how diversity of communication are involved in each office layout.

3.5 Communications analysis and result

3.5.1 Number of communication

The number of communication was counted by the way of the "communication IDs" and the "communication scenes". Fig. 5 shows that the number of communication IDs and scenes are in the bar chart, and the total communication running time is in the line chart. All the numbers are the sums of 2days in each layout experiment. Although both the number of the communication IDs and the communication scenes which is counted in the activating communications office layout is about the same as the one counted in the common office layout, the total communication running time in the activating communications office layout is 1.6 times longer than the one in the common office layout.
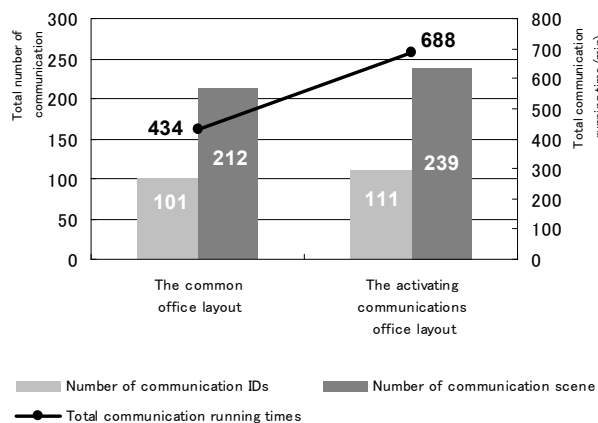

Figure 5. The total number of communication

3.5.2 A characteristic of the communication take place in the activating communications office layout

In order to analyze the result of the difference between the number of communication and the communication running time, the number of communication IDs were divided by a certain time period shown in table 3. The number of communication under five minutes was 87 communication IDs in both the common office layout and the activating communications office layout so that over 80% of the communication IDs are counted in a short conversation such as "greetings to group members", "asking a quick question to next person", etc. The authors cut these conversations and compared the conversation continued over 5 minutes (Fig. 6).

The number of the communication which continued over 10 minutes in the activating communications office layout is much higher than the one in the common office layout. This may predict that the activating communications office layout can create conversations which are important to progress their work.

Table 3. The number of communication IDs by the communication running times

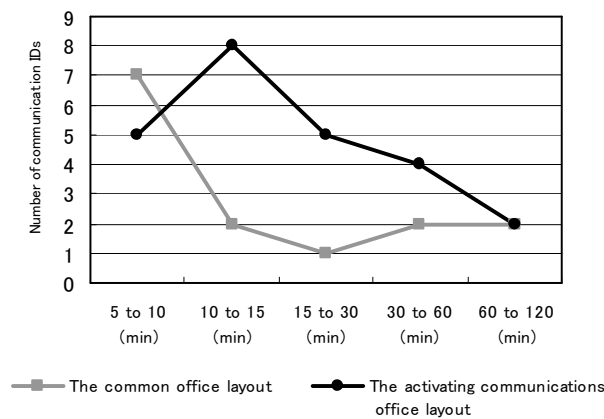|	Total number of	under 1 (min)	1 to 5 (min)	5 to 10 (min)	10 to 15 (min)	15 to 30 (min)	30 to 60 (min)	60 to 120 (min)
The common office layout	101	34	53	7	2	1	2	2
The activating communications office layout	111	40	47	5	8	5	4	2

Figure 6. The number of communication IDs over 5 minutes

3.5.3 Ten evaluation index and office layout

Fig. 7 shows the ratio that the numbers of the communication scenes in each evaluation indexes is divided by the total number of communication took place in each office (Fig. 4). Most of the ratio for the activating communication layout office is higher than the one for

the common layout office. Additionally, both No.3 "meta-discussion" and No.7 "action to wander in office" are the activity that is only observed in the activating communication layout office. This may be one of the phenomena that the activating communication layout office diversifies the communication take place in this office.

The authors analyze the ratio calculated in each zone of the office layouts and compared between the activating communication office layout and the common office layout. The descriptions of the relations between the factors of the activating communication office layout and communications selected to the evaluation indexes are listed as below.
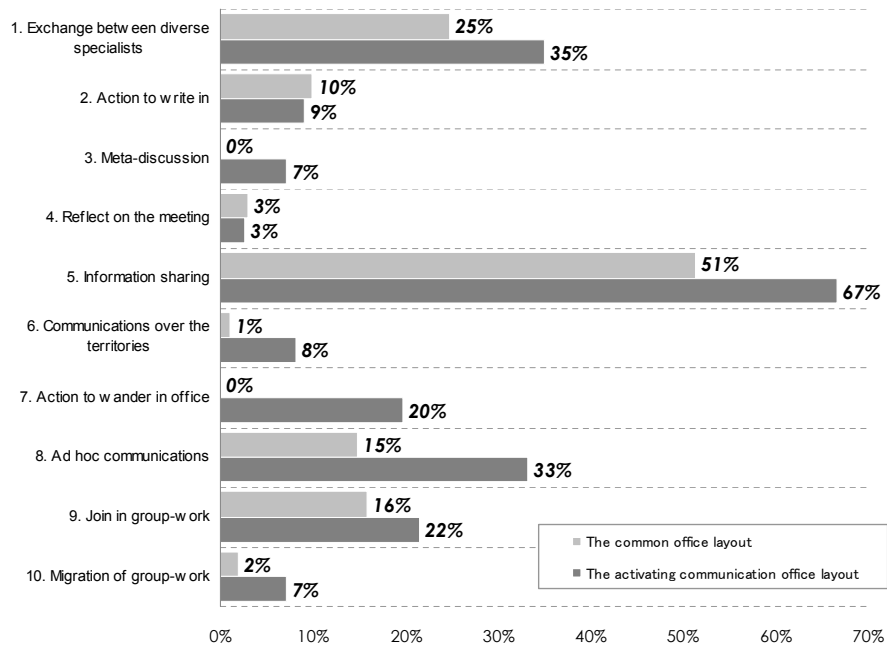

Figure 7. Comparison of the communications ratio

- The personal work zone

The ratio of No. 3 "meta-discussion", No. 6 "communications over the territories", No. 7 "action to wander in office", and No. 10 "migration of group work" observed in the personal zone of the activating communication office layout are over twice higher than the one in the common office layout.

The personal space that has no partition and open to other zones activates the communications took place over the territories, which is the evaluation index of No. 6. Additionally, the authors suspect that the communications that refer to indexes of No. 3 "meta-discussion" and No. 10 "migration of group work" are occurred due to a non-territorial long table where workers meet casually while they are sitting on their own chairs.

- *The group work zone*

The activities of No. 1 "exchange between diverse specialists", No.3 "meta-discussion", No.4 "reflect on the meeting", No.6 "communications over the territories", No. 7 "action to wander in office", and No. 8 "ad hoc communications" are not seen in the group work zone of the common office layout, which means that these activities are observed as new communications took place in the activating communication office layout. This is because of the open office environment and also the zone layout.

In addition, the ratios of No.9 "join in group-work" and No. 10 "migration of group-work" in the activating communication office layout, these are over twice higher than the one in the common office layout.

- *The refresh zone*

The ratio in the refresh zone of the activating communication office layout is compared with the ratio calculated by all communications took place in the common office layout due to the refresh zone of the common office layout is planed and located at outside of the office.

All ratios of No.1 "exchange between diverse specialists", No.3 "meta-discussion", No.4 "reflect on the meeting", No. 8 "ad hoc communications", and No. 9 "join in group-work" in the activating communications office layout are over 1.5 times higher than the one in the common office layout. The authors suspect that adding the refresh area in the office space can create informal communications which diversify the communications took place in the office such as "communications with diverse specialists" of the index No.1 and "communications took place before and after a meeting" of the index No.3 and No.4.

4. Discussion

The authors propose a way to evaluate quantitatively the activating communication in the office space. The numbers of communications occurred in the office are counted by the units of the communication IDs and the communication scenes. The ten evaluation indexes are defined through the research of the office layout trend and the case study in order to examine the diversity of communication. Through the experiment set up with the activating communication office layout and the common office layout, the relations between the office layout factors and communications are described with the "quantity" and the "diversity" of communications.

Although the authors discussed the method to evaluate communications quantitatively, the communications should be evaluated qualitatively as well. The communications that contribute to knowledge work will be discussed qualitatively in our future study. In addition, the ten evaluation indexes that have been defined through a case study will be also improved in order to increase its generalities.

References

[1] Franklin D. Becker: Total Workplace: Facilities Management and the Elastic Organization, *Van Nostrand Reinhold*, 1990

[2] Shimamura, H. Yamada, T., Sugiyama, T. H., Iwata, A. Study on The Free-address Process of Research Office Part1 Change of the amount and the places of communication in a free-address office with folding moving desks, *Transactions of AIJ. Journal of architecture, planning and environmental engineering 509*, pp.129-134, 1998

[3] Yamada, T., Shimamura, H., Iwata, Y., Sugiyama, T., A Study on The Free-address Process of Research Office Part2 Change of the amount and the places of communication in a free-address office with folding moving desks, *Transactions of AIJ. Journal of architecture, planning and environmental engineering 528*, pp.119-124, 2000

[4] Naka, R., Yamaguchi, S., A Study on the Tendency of Indicator Value of Office Area for Space Management, *Transactions of AIJ. Journal of architecture, planning and environmental engineering 551*, pp.135-143, 2002

[5] New Office Promotion Association, the14th – the17th Nikkei New Office Award, 2001-2005

[6] Franklin Becker, Fritz Steele: Workplace by design: Mapping the high-performance workscape, *Jossey-Bass*, 1995

[7] Tamaru, E., Hasuike, K. & Tozaki, M., 「A Field Study Methodology Using Self-Photography of Workplace Activities」, *DRS International Conference Common Ground*, 2002