Storage System Problems in the Workplace —Case Studies of the Workplaces in Tokyo and Fukuoka—

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Abstract The results of a survey that was carried out inside five account division workplaces of design companies in Tokyo and Fukuoka in order to identify problems concerning the personal storage system revealed that the main problem concerns how to organize the files within a desk. Firstly, there is a lack of available storage space and therefore a person couldn't work and sit well as the documents are piled up on the desktop and under the desk. Secondly, the files display within a desk is not sufficient to enable a worker to get what he/she needs easily. Hence, with purpose of overcoming the previous problems, we focused on three requirements: a) How to increase the personal storage space; b) How to display the documents well; and c) How to distribute the documents within a desk. We suggested a solution for each mentioned requirement. This study aims mainly to test the recommended solutions in order to examine their effectiveness to overcome those problems. The results of the tests that were conducted with 20 persons in a working area revealed that the files organization through the desk space has influences on the person's comfort and the time for file accessibility. *J Physiol Anthropol Appl Human Sci* 23(6): 331–335, 2004 <http://www.jstage.jst.go.jp/browse/jpa>

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Introduction

The storage unit is possibly the most important aspect of office furniture (Marmot and Eley, 2000). Although the term “office storage” typically calls to mind rows of metal file cabinets, storage in today's workplace takes on a more varied and dynamic role in work support (Hermanmiller, 1992). At present, most studies on storage systems focus on their design, quality, capacity as well as history for home usage and others (Yoon et al., 1998; Genkyou, 1999; Kuroda, 1993). The evaluation of the storage system efficiency in the workplace is limited. The author found, according to the results of the survey which was previously conducted within five account

division workplaces in Tokyo and Fukuoka, that about 62% of workers complained about the personal storage system (including his/her desk and its pedestal) and 38% of workers complained about the file cabinets (Elokla et al., 2003). As the majority of workers complained about the personal storage system, therefore this study aims to identify storage system problems and recommend solutions for them. Moreover, an experiment was carried out to examine the effectiveness of those solutions for overcoming the personal storage problems that have influences on the worker productivity.

Methods of the Survey

The survey was carried out as follows: first, five account division workplaces of design companies were visited as a field survey in order to observe and examine the current workplace and storage systems. This division was selected as we noticed that its workplaces are usually overloaded with the paper documents more than the other divisions' workplaces e.g. design and sales. Furthermore, some items are accumulated in the aisle and on the machines. Second, a series of interviews was carried out with 72 persons (male and female) who work in these workplaces to understand how they manage and organize their documents through the desk space and its pedestal. Third, a questionnaire was distributed among the workers to identify the problems of the personal storage system that affect their comfort and productivity.

Results and Discussion of the Questionnaire

The results of the questionnaire revealed that about 38% of workers have not enough space on the desktop for working as the files are piled up on it. About 26% of workers couldn't find the files which they need easily. About 16% of workers couldn't sit well as the files are stacked under the desk and about 12% of workers answered that there is no secure place on the desktop for keeping an important file. About 3% of workers answered that the quality of their desk is poor and 5% of workers selected another problem.

The first, second and third problems were identified as the main problems of the personal storage system because of their complaints in high percentage. According to the workers' answers, we realized that the first and third desk problems relate to the storage capacity and the files distribution within its storage space. The second problem relates to the files display.

Concerning the storage capacity and the distribution of the files through the desk space, this study tried to find an effective solution to stretch the personal storage space in order to be adequate for the big amounts of documents. The results of the survey showed that many workers have enormous amounts of documents and each worker is usually provided with one pedestal to keep all his documents and other supplies. Hence, they are forced to distribute the files through the desk space as follows: the frequently used files are usually placed on the desktop and the infrequently used files are placed in the pedestal. The remaining files are placed under the desk.

Actually, as offices are getting smaller than before, the personal storage space that is offered to each worker is limited. The office space standard in Japan continues to decrease in response to real estate costs and a tight economy. For example, the average workspace per person has shrunk from 11.21 square meters in 1995 to 10.19 square meters in 2001 (New Office Promotion Association, 2002).

As for the second problem of displaying the files through the personal storage space, we found that about 49% of workers rely on their memory to remember where information is. They don't use visual cues that might guide them to know the documents' locations and therefore they lose a lot of time to get what they need. Those workers mentioned that they don't have enough time to file each paper. On the other hand, about 27% of workers use the labeling and coding systems and about 24% of workers label only the important documents.

Concerning the files display through the personal storage space, we observed that the way of arranging the files in the pedestal is not convenient to see the files' tabs easily. Based on the survey, we realized that there are two types of file arrangement within a pedestal: side-to-side and front to back (Fig.1). Front to back is the common type used these workplaces.

Based on the former results, we recommend the following tips to overcome the problems:

1. Personal storage space can be stretched by going vertically rather than relying on the horizontal office space, e.g. by using an overhead bin or shelf.

2. Concerning how to display the documents well, a

worker needs to apply a clear filing system that enables him/her to find a required file quickly. The labeling and coding systems are strongly recommended as they help a worker to define the folder's location and return it to its home easily (Davenport, 2001; Davidoff, 1987; Steelcase, 2000). As for file arrangement type, this study recommends side-to-side type as a worker is not required to turn his/her body around or get up to see the files' tabs (Pollar, 1999).

3. Before distributing the documents through the desk space, a worker needs to consider how often each document is used per day/week. Frequently used document should be in hand so as to be accessed easily (Pollar, 1999; Eisenberg and Kelly, 1998). By following the former recommendations, a worker can overcome the previous problems of the personal storage system. In order to prove that the recommended tips are effective for organizing the files within a desk space well, we carried out the following experiment.

Methods of the Experiment

The experiment was conducted with 20 persons (Table 1) (15 men and five women—their ages ranging from 24 to 40 years old) in a working area. Those persons were asked to access the files from two workstations (each workstation consisted of desk and separated pedestal). We selected the common size of the desk unit and pedestal that is used in the companies we had previously visited. Their sizes are width 1200 mm depth 700 mm height 700 mm and width 400 mm depth 600 mm height 610 mm respectively. Files' organization through the first workstation accorded with the current situation which is used by many workers, but the second workstation accorded with the recommended situation of the files' organization.

In the second workstation, a person is provided with a vertical unit beside a pedestal to stretch the storage capacity. The selection of an added storage unit to the second work-

Fig. 1 Filing arrangement types in the pedestal.

Table 1 Persons' gender and height

Person	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Gender	Male	Male	Male	Male	Male	Female	Male	Female	Male	Male	Male	Male	Male	Male	Male	Male	Male	Female	Female	Female
Height (cm)	180	177	176	172	171	170	170	169	167	166	166	165	165	165	163	160	160	158	158	155

station is determined according to the persons' evaluations of three suggested units, e.g. low height, high height shelves and wagon.

On the other hand, the results of the survey that was carried out on 20 workstations in the visited workplaces to determine the average file meter "Fm" (a space that is occupied by documents in a workstation, 1 Fm=1000 mm) revealed that the average Fm of one workstation (including the space of desktop, pedestal, and under the desk) is about 1.1 Fm as follows: the average Fm on the desktop space is about 0.3 Fm, in the pedestal is about 0.5 Fm and the space under the desk is about 0.3 Fm. Since the size of one file box (A4 size) is width 310 mm×height 260 mm×thickness 100 mm. Therefore, eleven file boxes were placed within each tested workstation. Moreover, the files were classified into two groups based on their subject, i.e., groups A and B. Each group includes two topics for example. The folders of group A are kept in five file boxes. And the folders of group B are kept in the remaining six boxes.

Results and Discussions of the Experiment

In the beginning, three storage units were evaluated by 20 persons to select the most convenient one to be used through the second workstation. The three units were low height, high height shelves (their height from the desktop were 200 mm and 500 mm, respectively) and a wagon. However the convenient height for accessing the document from the shelf is 500 mm (from the desktop) (Architectural Institute of Japan, 2003; Kageyu, 1990). The persons' evaluations revealed that the low-height shelf on the desktop (its size is weight 700×depth 260×height 200 mm) is the most convenient storage unit to access the folders quickly as its low-height and location enable a person to see the files' contents easily.

Their evaluations' results were as follows: firstly, about 75% of persons selected a low shelf. Secondly, about 45% of them selected the pedestal and thirdly, about 70% of them selected a high shelf (Fig. 2). Moreover, the former recommended tips were tested in the following stages:

The first stage: effectiveness of stretching the storage space on the person comfort

Eleven file boxes were distributed within each desk space based on its available space. Basically in the first workstation (current situation), there are three spaces for placing those boxes, e.g. desktop space, pedestal, and under the desk. On the one hand, the numbers of the file boxes in each space accorded with the mentioned Fm. For example, three boxes were placed on the desktop. As for the pedestal, five boxes from group A and B were placed in its third drawer, as its size is suitable for A4 paper size. The remaining three file boxes of the former groups were placed under the desk. On the other hand, two storage spaces were available in the second workstation (proposal) e.g. pedestal and low-height shelf. The file boxes

Fig. 2 Persons' selections of the convenient storage unit.

Fig. 3 Persons' opinions of the available space on the desktop for working.

were distributed through the second workstation space as follows: six boxes of groups A and B were placed on the shelf. The third drawer of the pedestal is devoted to keeping five file boxes from the former groups. Then, each person was asked about his/her viewpoints of an available space on the desktop for working in both of the first and second workstations (Fig. 3). In the first workstation, about 40% of persons remarked that the situation was inconvenient and 30% of them found the space acceptable. In addition, about 20% of persons remarked that the situation was between acceptable and inconvenient levels. About 10% of persons said that it was between convenient and acceptable levels. In the second workstation, about 80% of persons found the situation was convenient and spacious for working.

Moreover, their opinions were required so as to know the suitability of an available leg space of the first and second workstations for sitting well (Fig. 4). Concerning the first workstation, about 65% of persons found the leg space acceptable. About 20% of persons said that it was between acceptable and inconvenient levels and about 15% said it was inconvenient. As for the second workstation, about 80% of persons found the leg space convenient.

Fig. 4 Persons' opinions of the available space under the desk for footing.

The second stage: effectiveness of the filing display on the time for the files accessibility

a. Filing system application test

We tested the time for accessing a file (the time that is spent to access the required file) by placing five file boxes within each workstation in the same place, e.g., on the shelf but in different status of display. For example, in the first workstation, a person relied on the folders' tabs to find the required file. As for the second workstation, a clear filing system was applied by labeling each file box (including the main title, subtitle of its subject, as well as the folders' names) and the font size was point 11 as it is convenient for clear visibility (Morgenstern, 1998; Wogalter and Vigilante, 2003). In addition, we used different color tabs to differentiate between the folders of each group (e.g. the tab's color of the folders of group A was orange, and the folders of group B was blue). Next, each person was asked to access a certain file from the first workstation, and then from the second one. While each person was searching for the required file, we measured the time that was spent to get a file by using a stopwatch. The result of this test showed that the average time of file accessibility in the current situation was about 14 seconds and in the proposed one was about 9 seconds. According to this test and the persons' opinions, we identified that the labeling and coding systems enable a person to find the file quickly (Fig. 5–Test 1).

b. Filing arrangement test

According to the internal depth size of the pedestal (580 mm) and the width size of the file box (310 mm), three boxes were arranged from front to back in the pedestal of the first workstation. On the other hand, another three boxes were arranged from one side to the other side in the pedestal of the second workstation. The tested boxes in both of these situations were applied to the same filing system (including the labeling and coding systems). Then, each person was asked to access a certain file from these workstations. While each person was searching for the required file, we measured the time that was spent to get a file by using a stopwatch. The result of this test showed that the average time for accessing the files in the current situation was about 11 seconds and in

Fig. 5 Filing display within the workstation.

the proposed one it was about 9 seconds. According to this test and the persons' opinions, we detected that a person can find the required file easily when the files' tabs are directed to his/her sight (Fig. 5–Test 2).

The third stage: effectiveness of the files' locations within the workstation on the time for file accessibility

The purpose of this test is to identify whether the location of the files through the workstation space affects the time for file accessibility. This stage was accomplished as follows: five file boxes were placed within the pedestal of the first workstation. On the other hand, five boxes were placed on the shelf of the second workstation. File boxes of those workstations were subject to the same filing system (including the labeling and coding systems). Then, each person was asked to access a file in these situations. While each person was searching a required file, we measured the time that was spent to access a file. The result of this test showed that the average time for accessing files in the current situation was about 12 seconds and in the proposed situation was about 9 seconds. Persons mentioned that the files' location on the shelf enables them to see the contents of each file box quicker than the current situation in which files are hidden in the pedestal (Fig. 6–Test 3). Next, the file boxes' locations within those workstations were shifted as follows: five file boxes were placed under the first desk (on the floor). On the other hand, five file boxes were placed within a pedestal of the second workstation. Boxes in these two conditions had the same filing system (including the labeling and coding systems). Then, each person was asked to access a certain file in both of these situations. While each person was searching a required file, we measured the time that was spent to access it. The results of this test revealed that the average time for accessing files in the first workstation was about 15

Fig. 6 Effectiveness of the files' locations through the workstation on the time of file accessibility.

seconds and in the proposed situation was about 11 seconds. In the current situation, a lot of effort is required to access a file because a person has to bend forward to search and pick up what he/she needs (Fig.6–Test 4).

According to the results of the previous stage, we recommend that a worker uses a shelf upon the desktop for placing the frequently used files. Regarding the pedestal, it is devoted to placing the files that are not used continuously.

Basically, the former tests demonstrate that the organization of files within the workstation space concerning the distribution of files and their display is an important influence on the person's comfort as well as the time of file accessibility during the work-time.

Conclusions

It can be concluded from this study that displaying and distributing the files well through the workstation can facilitate worker performance and satisfaction with the workplace. The main results of this study revealed that the high efficiency of personal storage for the file accessibility demands two essential requirements: firstly, the worker needs to display the files clearly within the workstation by applying the filing system concerning the labeling and coding systems with each paper. In addition, we recommend that a worker uses side-to-side type of file arrangement within a pedestal in order to pick up simply what he/she wants. Secondly, the worker is required to distribute the files within his/her workstation based on frequency of use.

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