

## Study on the storage system in the Japanese workplace

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### **Part 3 Study on the Storage System Features**

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### **3-1 Survey of the Storage Products in the Market**

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## Part 3- 1

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### Survey of the Storage Products in the Market

#### 1. Introduction

Since the results of part 2 revealed that the paper documents have taken up great space of the storage within the workplace. Therefore, this research focused on evaluating and examining the paper storage systems efficiency within the workplace.

In order to accomplish our aim, we tried firstly through this chapter to present the main features of the paper storage furniture in the current market. In addition, how they are modified to match with the today's office environment and work style which have greatly influenced by the rapid advance of information technology (IT), including communications technologies, the creation of office networks, the proliferation of personal computers (PCs) and other tools that change the way in which people work [1]. The nature of office work becomes less defined and predictable and much more fluid and fast changing. A worker has greater freedom of choice regarding work location [2, 3].

In this chapter, we attempted to identify the current paper storage furniture which is available in the market.

#### 1.1 Purpose

We aim mainly to present the available storage units in the current Japanese market concerning its types, size and capacity. As well as, we attempted to identify the most important modifications regarding the design of the storage units from 1950s to the present time in order to be adequate for the current work style and office space.

#### 1.2 Methods

This study was carried out as follows: firstly, four furniture manufactures in Fukuoka and Tokyo were visited to present the current storage units, including their types, size and capacity within the Japanese market. We selected famous manufactures for the sales of the office furniture in Japan, such as Kokuyo, Itoki, Uchida, and Plus.

Secondly, we observed their showrooms and carried out series of interviews with the designers. Furthermore, several catalogs of the mentioned manufactures were examined in order to present the available storage products in the market and identify the critical modifications of the storage units that meet the requirements of different work types.

## **2. Results and discussions**

From the survey within the market, we found out that there is a variety of office furniture, for example, fixed and mobile elements that apply the concept of creating an appropriate office space for diverse office works. It accommodates many types of work-from the formal to the casual. Today, most furniture manufactures seek to respond to the client needs by considering several points in the office furniture design, such as, comfort, suitability for the task, appearance and appropriateness of image, low cost, quality of finishes, as well as accessories and options for variation.

Concerning the storage furniture, we observed that there are several products of the wooden and metal storage units available in the market. This study focused on the latter storage type that is commonly used in the workplace. It is more preferable for the clients than the former one, as it can provide robustness and neatness of design, in addition to its lightness.

The storage units are classified into two categories according to the unit's ownership, personal and communal use. Both the previous storage categories within the market were presented and evaluated in this chapter.

### **2.1 Defining the storage capacity**

The storage units capacity (either personal or communal use) to keep A4 paper size can be defined in term of "File meter"(Fm), 1000mm= 1Fm [4].

The following are the main features of the storage units, such as, types, size and capacity.

### **2.2 Personal storage products within the market**

It is located through the personal workstation (a space that is devoted for working in by individual and it includes the work table, chair, as well as storage unit) and it is usually used independently [5- 8].

There are different types of the personal storage units available in the market. We selected from one to three marketable products of each type to present it as examples. The size and capacity of each product are shown in fig.1, 2 [9- 13]:

1. Pedestal: it has two types. First one is combined with a worktable and second type is separated from a worktable. Separated pedestal has two models: first one is fixed and the second model is mobile (on wheels). A separated pedestal is usually placed under the worktable because its height is lower than the worktable height. Usually, a pedestal includes from two to three drawers.

2. Wagon: it is usually open unit (including shelves) in order to make the information not hidden. In addition, it is usually fitted with castor for easy movement. A wagon is usually used as a subsidiary storage unit of a pedestal for placing the documents.


























Manufacture	Storage Unit Type							
	Pedestal		Wagon/Cart	Vertical Unit on the Desktop	Shelf		Overhead bin	Tray
	Separate from the desk	Combined with the desk			Bottom (desktop)	Upper (desktop)		
Kokuyo [9]	Mobile  400 22 600 A4 271 283 H400mm x D600mm x H610mm 1.2 Fm	Desktop  400 29 316 319 700 A4 271 283 H400mm x D600mm x H700mm 1.3 Fm	Mobile  500 200 215 A4 215 H500mm x D300mm x H615mm 1.1 Fm	 265 235 250 H265mm x D325mm x H345mm		 706 239 187 5 335 H706mm x D239mm x H42.5mm 0.7 Fm	 200 390 420 505 H200mm x D390mm x H420mm 0.8 Fm	 115 232 235 H115mm x D232mm x H235mm
	Mobile  400 90 600 A4 271 283 H400mm x D600mm x H610mm 0.6 Fm	Desktop  400 71 271 291 700 A4 271 283 H400mm x D600mm x H700mm 1.2 Fm	Mobile  500 290 hold A4 225 H500mm x D300mm x H725mm 1.1 Fm			 568 270 112 254 60 H568mm x D270mm x H442mm 0.59 Fm		
	Mobile  410 150 600 A4 271 283 H410mm x D600mm x H610mm 0.6 Fm	Desktop  410 150 271 291 700 A4 271 283 H410mm x D600mm x H700mm 1.3 Fm	Mobile  410 150 300 300 A4 271 283 H410mm x D450mm x H660mm 1.3 Fm					
Itoki [10]	Mobile  400 120 600 A4 271 283 H400mm x D600mm x H610mm 0.6 Fm	Desktop  400 300 292 292 A4 271 283 H400mm x D600mm x H700mm 0.6 Fm	Mobile  410 231 295 490 A4 231 295 H410mm x D400mm x H620mm 0.3 Fm			 1200 260-50 2150 A4 271 283 H1200mm x D260mm 2.4 Fm	 1200 420 94 455 525 H1200mm x D420mm x H620mm 1.2 Fm	 94 298 209 H94mm x D298mm x H209mm
	Mobile  300 237 700 A4 271 283 H300mm x D700mm x H617mm 1.2 Fm		Mobile  670 277 270 450 110 A4 277 270 H670mm x D450mm x H620mm 1.3 Fm			 1189 600 700 A4 600 700 H1189mm x D246mm x H189mm 1.2 Fm		
	Mobile  290 292 600 A4 271 283 H290mm x D600mm x H617mm 0.4 Fm		Mobile  400 292 450 100 A4 292 100 H400mm x D450mm x H700mm 0.4 Fm					

Fig. 1 The Personal Storage Products Within the Current Market (Kokuyo and Itoki Manufactures)


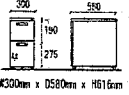
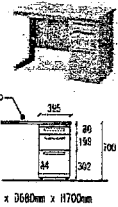

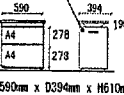

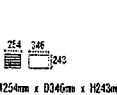

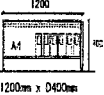

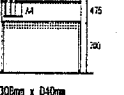

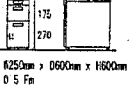

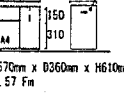

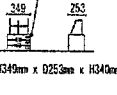

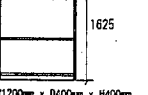

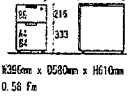

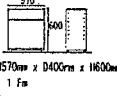

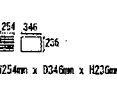

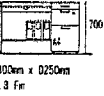

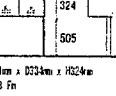

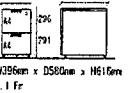
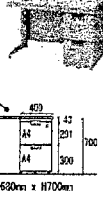

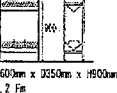
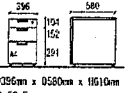
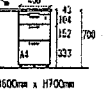
Manufacture	Storage Unit Type								
	Pedestal		Wagon/Cart	Vertical Unit on the Desktop	Shelf		Overhead bin	Tray	
	Separated from the desk	Combined with the desk			Bottom (desktop)	Upper (desktop)			
Uchida [11, 12]	Mobile   W390mm x D580mm x H610mm 0.6 Fm	Desktop  W395mm x D680mm x H700mm 0.68 Fm	Mobile   W590mm x D394mm x H610mm 1.1 Fm	  W254mm x D346mm x H243mm 316mm 436mm	  W1200mm x D400mm 1.2 Fm	  W1200mm x D400mm 0.3 Fm			
	Mobile   W290mm x D600mm x H600mm 0.5 Fm		Mobile   W570mm x D360mm x H610mm 0.57 Fm	  W348mm x D253mm x H340mm			  W1200mm x D400mm x H400mm 1.2 Fm		
Plus [13]	Mobile   W396mm x D580mm x H610mm 0.58 Fm		Mobile   W570mm x D400mm x H600mm 1.1 Fm	  W254mm x D346mm x H205mm	  W1200mm x D250mm 0.3 Fm		  W731mm x D334mm x H524mm 0.73 Fm		
	Mobile   W396mm x D580mm x H610mm 1.1 Fm	Desktop  W400mm x D680mm x H700mm 1.3 Fm	Mobile   W503mm x D350mm x H600mm 1.2 Fm						
	Mobile  W396mm x D580mm x H610mm 0.55 Fm	Desktop  W440mm x D600mm x H700mm 0.6 Fm							

Fig. 2 The Personal Storage Products Within the Current Market (Uchida and Plus Manufactures)

3. Vertical unit: it is placed on the working space of desk for keeping frequently used papers vertically (place one paper upon the other one).
4. Shelf: it has two types in the market: first one is usually used upon the desktop. This type has different heights, e.g. 500mm and 260mm. Second type of shelf is placed under the desktop for placing infrequently used files and the items that are required to be invisible.
5. Overhead bin: it is usually supported by the panel system and the other models are fixed in the desk by posts.
6. Tray: it is usually joined to the panel system. This storage product has three types within the market: first one is used to keep the folders horizontally (place one file beside the other one). Second one is used to keep the papers vertically. Concerning the third type, it is designed to keep the folders diagonally.

The mentioned products are characterized by strong constructions, mobility to be moved from place to the other one easily by fitting them with wheels and brakes good for rolling about and stopping complete. In addition, some products, such as, a pedestal and wagon are provided with whether handle or hold for easy movement. Actually, there is a wide variety in sizes available in the market to enable coordination of different areas and needs. A slot for a label is provided to allow a person's name or the contents to be shown. The personal storage products have different colors that can be easily coordinated with other furniture and the office environment.

In fact, as there are several types of the personal storage furniture within a market, it would be difficult to study on their design developments. Therefore, a pedestal is selected to identify its design modifications because it is the earliest personal storage unit used in the workplace [14]. We discussed the development of the pedestal size and how it affects on its capacity, application and the worker's comfort. In addition, we focused on the development of its mobility.

The results of the survey revealed that there are two types of a pedestal in the market, e.g. types A and B. Type A has been in the market since 1950s. In this type, a pedestal and worktable are combined together to be one unit. As for type B, it has been in the market since 1980s. A pedestal and worktable are separated from each other. As it was previously mentioned that the second pedestal type has two models: first one is fixed (without castors/ wheels) and the second model is fitted with castors.

The following descriptions and analysis concern the modifications of the pedestal design from 1950s to the present day within the market (Fig. 3) (Table 1).



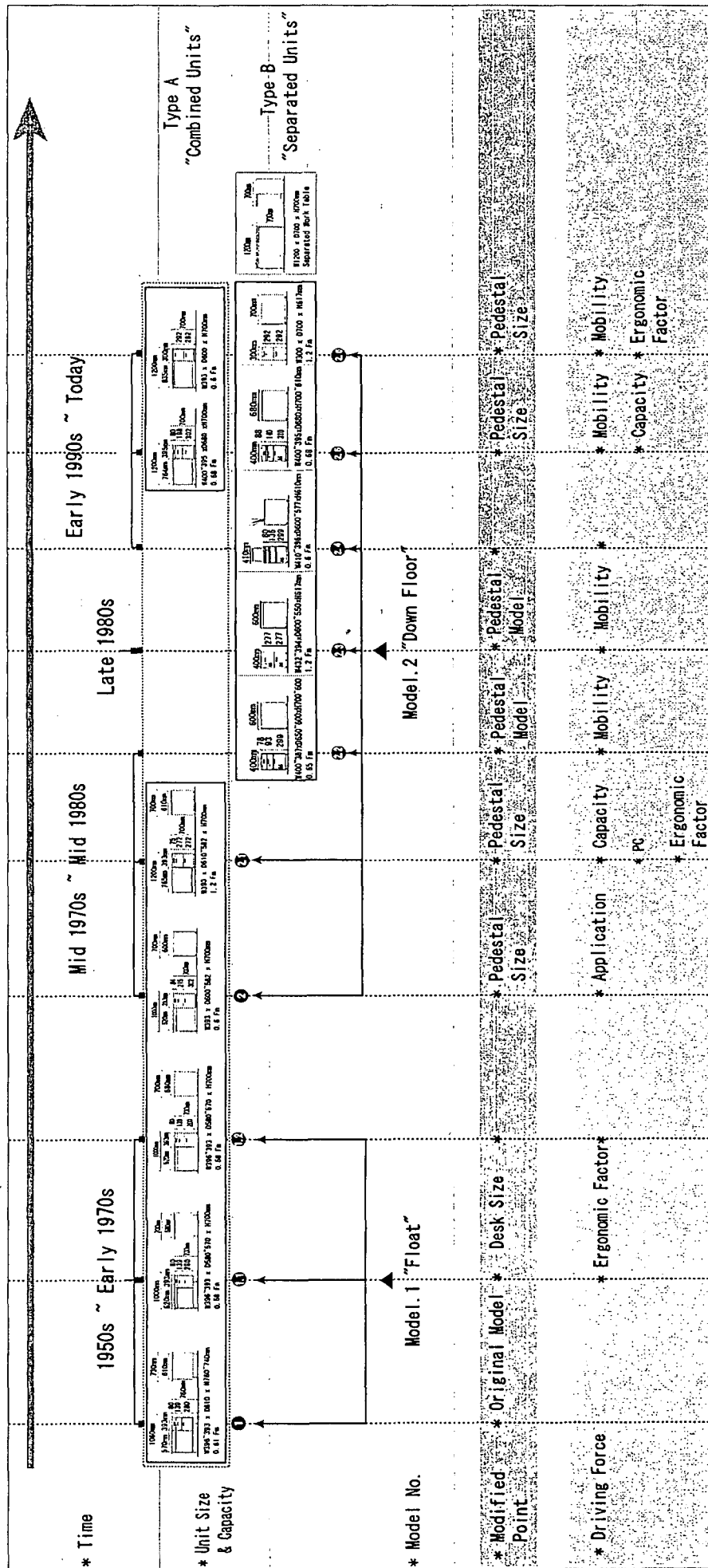


Fig. 3 The Modification of the Pedestal Design From 1950s to the Present Day

Table 1 The Size of Pedestal from 1950s to the Present Day in Kokuyo, Itoki, Uchida and Plus Manufactures

Model No. Manufacture	1	2	3	4	5	6	7	8	9	10	11
Kokuyo	A W393 x 0610 x H760 740 0.1 W393 x 0610 x H80 0.2 W393 x 0610 x H139 0.3 W393 x 0610 x H280 [15]	A W400 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]	A W393 x 0580 x H700 0.1 W393 x 0580 x H154 0.2 W393 x 0580 x H200 0.3 W393 x 0580 x H280 [15]
Itoki	A W396 x 0610 x H760 740 0.1 W396 x 0610 x H78 0.2 W396 x 0610 x H162 0.3 W396 x 0610 x H280 [16]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]	A W396 x 0572 x H700 0.1 W396 x 0572 x H78 0.2 W396 x 0572 x H162 0.3 W396 x 0572 x H280 [20]
Uchida	A W395 x 0610 x H760 740 0.1 W395 x 0610 x H80 0.2 W395 x 0610 x H139 0.3 W395 x 0610 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]	A W393 x 0570 x H700 0.1 W393 x 0570 x H74 0.2 W393 x 0570 x H139 0.3 W393 x 0570 x H280 [17]
Plus	A W393 x 0610 x H760 740 0.1 W393 x 0610 x H78 0.2 W393 x 0610 x H162 0.3 W393 x 0610 x H280 [18]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]	A W395 x 0578 x H700 0.1 W395 x 0578 x H78 0.2 W395 x 0578 x H162 0.3 W395 x 0578 x H280 [21]

A Unit Size  
D Drawer Size  
D1 First Drawer  
D2 Second Drawer  
D3 Third Drawer

### 2.2.1 The modification of the pedestal design from 1950s ~ today

- Pedestal type A:

A float pedestal model was marketed during the 1950s and 1960s. Its size is width 396mm~393mm x depth 610mm x height 760mm~740mm and it includes three drawers. The worktable size is width 1060mm x depth 730mm x height 760~740mm (Fig. 3- Model 1) (Table 1) [15-18].

In the early 1970s, the Japanese Industrial Standard (JIS) introduced a new size of worktable width 1000mm x depth 700mm x height 700mm [19]. A pedestal size is width 396mm~393mm x depth 580mm~570mm x height 700mm (Fig. 3- Model 1.1 and 1.2) (Table 1) [15, 20, 17, 21, 22].

In the mid 1970s, a down floor pedestal was marketed and it includes three drawers. The size of first, second, and third drawers are width 400mm~394mm x depth 600mm~582mm x height 99mm~80mm, 215mm~198mm, 316mm~299mm respectively (Fig. 3- Model 2) (Table 1) [23, 20, 17, 24]. During that period and the beginning of 1980s, another model of down floor pedestal was emerged in the market and it includes from two to three drawers. In fig.3, the size of first, second, and third drawers of pedestal model 2.1 are width 400mm~393mm x depth 610mm~582mm x height 80mm~56mm, 209mm~198mm, 302mm~300mm respectively. Regarding the worktable size, it is width 1200mm x depth 700mm x height 700mm (Table 1) [25, 20, 17, 24].

- Pedestal type B:

In the early 1980s, another model of a down floor pedestal was emerged in the market and it is separated from a worktable (fixed- without castors). The size of pedestal is width 400mm~387mm x depth 650mm~600mm x height 700mm~600mm (Fig. 3- Model 2.2) (Table 1) [25, 20, 17, 24].

By the late 1980s, a mobile pedestal (on the wheels) was emerged in the market. Its size is width 432mm~394mm x depth 600mm~550mm x height 645~610mm (Fig. 3- Model 2.3) (Table 1) [25- 28].

In the early 1990s, another model of a mobile pedestal was emerged in the market and it is fitted with a handle. Its size is width 410mm~396mm x depth 600mm~577mm x height 621mm~610mm (Fig.3- Model 2.4) (Table 1) [29- 32].

In the beginning of this century, a new model of mobile pedestal was emerged and it is deeper than the previous models. Its size is width 400mm~395mm x depth 700mm~680mm x height 700mm~610mm (Fig. 3- Model 2.5) (Table 1) [33- 36].

Regarding the newest model of pedestal which was emerged in 2002/2004, its size is somewhat different, width 300mm x depth 700mm~500mm x height 650mm~610mm (Fig. 3- Model 2.6) (Table 1) [9, 10, 11, 13].

### 2.2.2 Driving force to modify a pedestal

Based on the survey, the driving force that led to modify a pedestal from 1950s to the present day was analyzed as follows (Fig. 3):

- The change from model 1 to model 1.1 and 1.2:

The main reason which led to change the desk from model 1 to model 1.1 and 1.2 was related to an ergonomic factor (Fig. 3). In 1950s, an existing desk size, e.g. model 1 was not comfortable enough for the majority of the workers as its height was somewhat high (760~740mm). Based on the survey, we detected that the desk size in that time was originated from the American occupation army [37].

Ergonomically, the convenient desk height for the Japanese human size is about 700mm [38- 40]. Therefore, in 1974, new JIS (Japanese Standards Association) was emerged [19] and introduced the new desk size, e.g. model 1.1 and 1.2 to provide a person with a required comfort during the work-time.

- The change from model 1.1 and 1.2 to model 2:

In the mid 1970s, an emergence of down floor pedestal was related to an application factor (Fig. 3). An internal size of third drawer of a float pedestal model is width 320mm x depth 540mm x height 230mm. This size fits well for B5 folder size (width 271mm x height 192mm x thickness 20mm) that was often used since 1950s until the early 1990s in the Japanese companies. As for keeping B4 folders which were sometimes used, a worker piled them, for example, in the front drawer of a worktable or on the desktop or in the third drawer of a pedestal, as the mentioned paper size somewhat big (width 378mm x height 271mm x thickness 20mm). But the down floor pedestal, an internal size of its third drawer is big enough (width 320mm x depth 540mm x height 280mm) to place and arrange B4 paper size horizontally (Fig. 4).

Basically, the horizontal arrangement of folder is better than the vertical arrangement in order to see simply the folder's tab [41, 42]. There is a minor benefit of a down floor pedestal and it is related to the maintenance factor. No doubt, with a down floor pedestal, a person is not required to clean under it continuously as a float pedestal model.

- The change from model 2 to model 2.1:

In the late of 1970s and beginning of 1980s when the intelligent buildings were a trend up to appearance, efforts have been made in the field of office and furniture designs to accommodate the advanced information technology [18]. In that period, since the proliferation of technological hardware, e.g. the personal computer (PC) takes up a greater percentage of the desktop space (about 50%), the desktop size was increased to become 1200mm instead of 1000mm, such as, a desk model 2.1. In addition, there is another reason from stretching the width of desk.

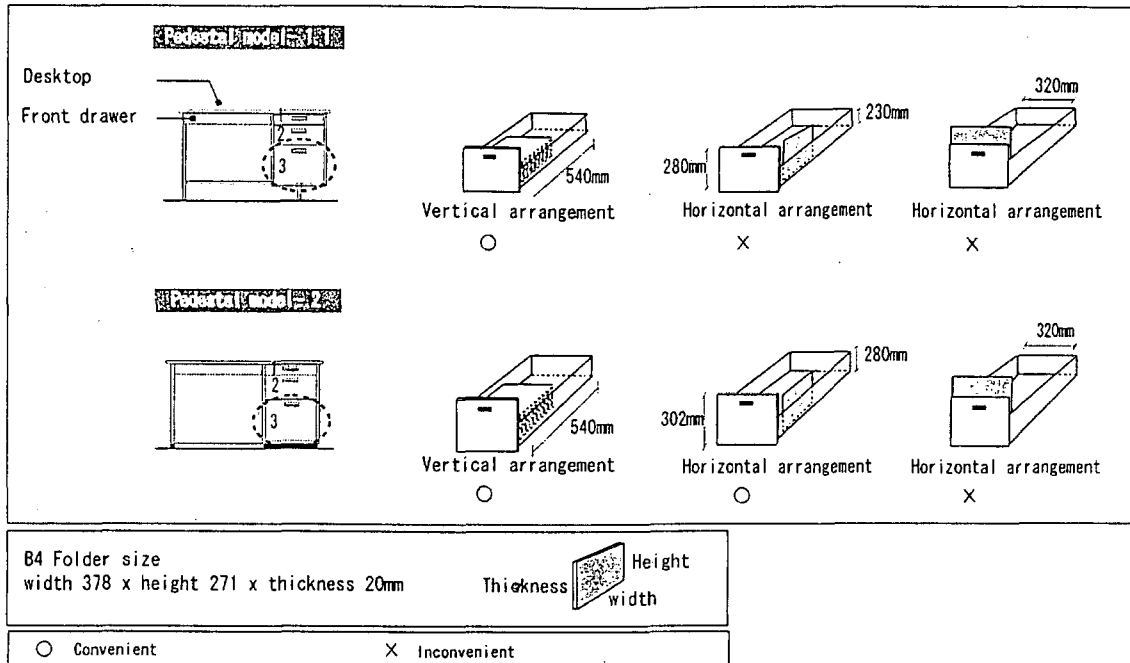


Fig. 4 The Arrangement of B4 Paper Size Within the Third Drawer of Pedestal Model 1.1, 1.2 and 2

As it is shown in fig. 3 - model 2.1 that increasing the width of desk led to stretch an available leg space (a space that is devoted under a desk for the worker's legs) from 520mm to 765mm in order to keep, e.g. the tower of a computer's hard disk which occupies about 300mm of this space.

Regarding a pedestal, the size of its drawers was changed so as to increase its capacity. The former pedestal models have only one drawer for placing B5 paper size. But in the case of pedestal model 2.1, there are two drawers to place B5 paper size. This means that the capacity of pedestal for placing B5 paper size becomes twice the capacity of the former pedestal's models. Furthermore, this pedestal model is fitted with joists instead of a base (its height ranging from 70mm to 50mm) in order to make an adequate space for placing the electric wires (Fig. 3).

- The change from model 2.1 to model 2.2:

Since the traditional desk (including a worktable and pedestal, e.g. models 1.1, 1.2, 2 and 2.1) is bulky and difficult to be moved inside the workplace. Therefore, in the early 1980s, a separated pedestal was emerged to enable a worker somewhat to change its spot within his/her workstation space whenever they want (Fig. 3).

- The change from model 2.2 to model 2.3:

In the late of 1980s, the mobile and lightweight office furniture was emerged to accommodate the new way of working that calls attention to the importance of

teamwork for creating new ideas and solving the complex work problems [19]. In that period, the office manufactures began to take notice of the pulse of their clients. What they needed was furniture that could roll around and accommodate their work type.

A mobile pedestal, such as, a pedestal model 2.3 is mainly designed so as to move simply with its owner from one place to the other one [7]. Moreover, it enables the workers to rearrange their own work area according to their needs and comfort [43] (Fig. 3).

- The change from model 2.3 to model 2.4:

In the early and mid 1990s, several models of a mobile pedestal were emerged in the market. For example, a pedestal model 2.4 is fitted with a handle for pulling it easily (Fig. 3).

- The change from model 2.4 to model 2.5:

By 2001, another attempt was emerged to increase the pedestal capacity for placing A4 paper size. For example, the depth of pedestal model 2.5 is stretched from 610~550mm to 680mm. As a result, the capacity of a drawer which its size accommodates A4 paper size became bigger than the previous pedestal's models. For example, usually the capacity of one drawer (A4 paper size) is ranging from 0.61Fm to 0.55Fm, but in the case of pedestal model 2.5, it is about 0.68Fm (Fig. 3).

- The change from model 2.5 to model 2.6:

In 2002, a new model of pedestal 2.6 has been in the market. It is characterized by small size. Usually, the width of pedestal is ranging from 400mm to 393mm. But the width of a new model is 300mm. The intention is to stretch an available leg space, e.g. from 764mm to 835mm. Therefore, an available space for the worker's legs is increased from 464mm to 535mm in order to offer a worker the required comfort during the work-time [40]. As for the remaining space (about 300mm), it is devoted for keeping the computer's hard disk for example.

Overall, from the former analysis, we identify that the pedestal size is needed to modify in order to accommodate the different paper sizes and increase its capacity. Moreover, the changed pedestal size provides a worker with an enough space under the worktable for his/her legs and for keeping the essential items too. As for the pedestal mobility, most of the manufactures and designers believe that a mobile pedestal is really required inside a workplace for aiding a worker to carry out his/her works comfortably, so that their productivity might be increased. Productivity is defined as a general concept similar to effectiveness and performance [44].

The next descriptions and evaluations concern the features and the modifications of the communal storage unit in the market.

### 2.3 Communal storage products within the market

It is nearly devoted to serving the majority of workers in the workplace. There are different types of the communal storage units in the today's market. For example, open, drawer, door, slide, crystal tray, and combination units. Each mentioned type has various sizes and capacity to suit what is to be stored as well as the current office size. This study presented different types of the file cabinet size width 800mm x depth 450mm as the results of the survey within the market revealed that the mentioned size is usually required to be used inside the workplace (Fig. 5) [9, 10, 12, 13].

The file cabinets in the market are characterized by having doors and drawers that move easily, do not take up unnecessary space or restrict access when it is opened. Strong constructions and smooth finishes, especially where people will come in contacting with edges and corners. Good locks, with suited keys available, where locking is needed. A label on the storage is used to identify the person's name or the contents easily.

Based on the survey, we found out, that the most important modification of the communal storage unit from 1950s to the present day concerns its size. The modification of the unit size is for saving the office space and increasing the unit's capacity as well. Therefore, this chapter focused on the change of the storage size and its positive consequences (Fig. 6).

#### 2.3.1 The modification of the file cabinet design from 1950s ~ today

In the early 1950s, a workplace was crowded with a lot of storage units that have various sizes. In that period the storage unit height was handy reach, e.g. 1335 and 1400mm, in order to access the files easily [41].

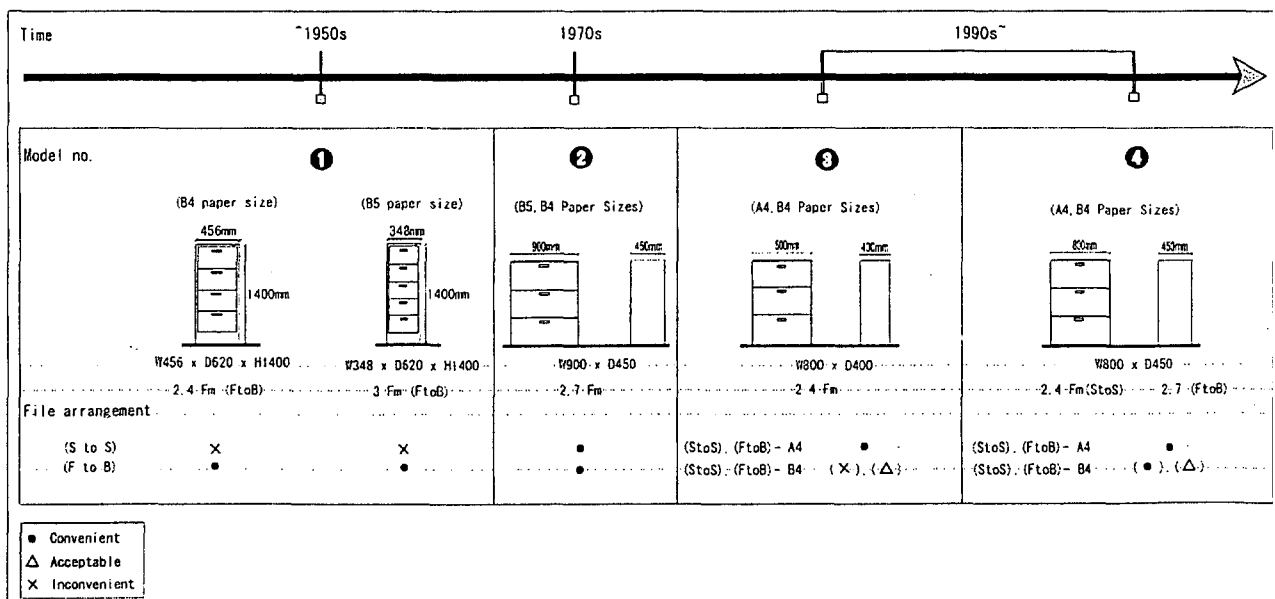


Fig. 6 The Development of the File Cabinet Size From 1950s to the Present Day



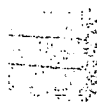




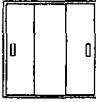



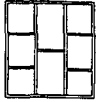


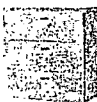




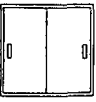


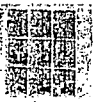
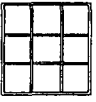



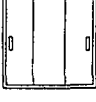

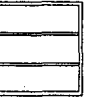

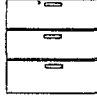

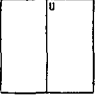

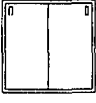



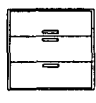
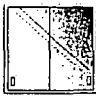
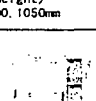
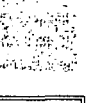
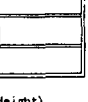

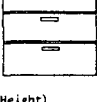







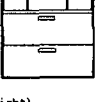
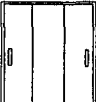
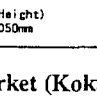
Manufacture	File Cabinet's Types						Size
	Open	Drawer	Door	Slide	Crystal Tray	Combination	
Kokuyo [9]	  (Height) 1040mm	  (Height) 1040mm	  (Height) 1040mm	  (Height) 1040mm	  (Height) 1040mm	  (Height) 1040mm	W800 x D450mm
Itoki [10]	  (Height) 700, 890, 1040, 1200, 2100mm	  (Height) 890, 1040, 1200, 2100mm	  (Height) 700, 890, 1040, 1200, 2100mm	  (Height) 700, 890, 1040, 1200, 2100mm	  (Height) 890, 1040, 1200mm	  (Height) 890, 1040, 1200mm	W800 x D450mm
			  (Height) 890, 1040, 1200mm	  (Height) 700, 890, 1040, 1200, 2100mm			
Uchida [12]	  (Height) 900, 1050, 1200, 2100mm	  (Height) 900, 1050, 1200, 2100mm	  (Height) 900, 1050, 1200, 2100mm	  (Height) 900, 1050, 1200mm	  (Height) 1050, 1200mm	  (Height) 900mm	W800 x D450mm
				  (Height) 900, 1050mm			
Plus [13]	  (Height) 890, 1050, 1210mm	  (Height) 1050, 1210mm	  (Height) 720, 890, 1050, 1210, 2100mm	  (Height) 890, 1050, 1210mm	  (Height) 1050, 1210mm	  (Height) 1050mm	W800 x D450mm
				  (Height) 1050mm			

Fig. 5 The File Cabinet Products in the Current Market (Kokuyo, Itoki, Uchida and Plus Manufactures)



**Table 2 The Size of File Cabinet in Kokuyo, Itoki, Uchida and Plus from 1950s to the Present Day**

Model No.	1	2	3	4
Kokuyo	W348 x D620 x H1400mm W456 x D620 x H1400mm [15]	W898 x D450 x H1050mm W900 x D450 x H1050mm [23]	W800 x D400 x H1100mm 1050mm [33]	W800 x D450 x H1040mm W800 x D450 x H1050mm [46]
Itoki	W348 x D620 x H1400mm W494 x D620 x H1335mm [16]	W900 x D450 x H1040mm [16]	W800 x D375 x H1200mm W900 x D400 x H1040mm [45]	W800 x D450 x H1200mm [30]  W800 x D450 x H1050mm [10]
Uchida	W348 x D620 x H1400mm W456 x D620 x H1400mm [27]	W900 x D450 x H1110mm [17]	W800 x D400 x H1050mm [35]	W800 x D450 x H1050mm [11]
Plus	W346 x D620 x H1400mm W456 x D620 x H1400mm [18]	W898 x D450 x H1050mm [21]	W800 x D400 x H1050mm H1210mm W900 x D400 x H1050mm [32]	W800 x D450 x H1050mm H1100mm H1210mm [47]

There were different sizes of the file cabinet concerning its width and depth in order to cope with different folders' sizes, whether B5 or B4 (the common paper size used in this period). For example, the size of the drawer cabinet for keeping B5 paper size is width 348mm x depth 620mm x height 1400mm and the unit capacity is about 3 Fm. Concerning B4 paper size, an adequate size of drawer cabinet to keep it is width 456mm x depth 620mm x height 1400mm and the unit capacity is about 2.4 Fm (Fig. 6 - Model 1) (Table 2) [15, 16, 27, 18].

Concerning file arrangement within the drawer unit, there are two types: first one is side - to - side (S to S) which means that the file is placed from one side of the drawer to the other side. Second type is front to back (F to B) which means that the files are placed from the front of the drawer to its back (Fig. 7).

The results of the survey showed that the second type of the files' arrangement (F to B) was adequate for keeping B5 and B4 folders size (the common file tools was used in that period) within the file cabinets [21, 15]. For example, according to the size of the drawer (width 456mm x depth 620mm x height 300mm) and the size of B4 folder (width 378mm x height 271mm x thickness 20mm), we found that about 242mm of the drawer space is not employed when the files are arranged side to side (Fig. 8).

By 1970s, a wall unit was emerged and used in the workplace [20]. It consists of several types of file cabinets, such as open, drawer, door, combination units and they are connected together to become one unit. In that time, the marketable size of the file cabinet was width 900mm x depth 450mm (Table 2) [23, 16, 17, 21].

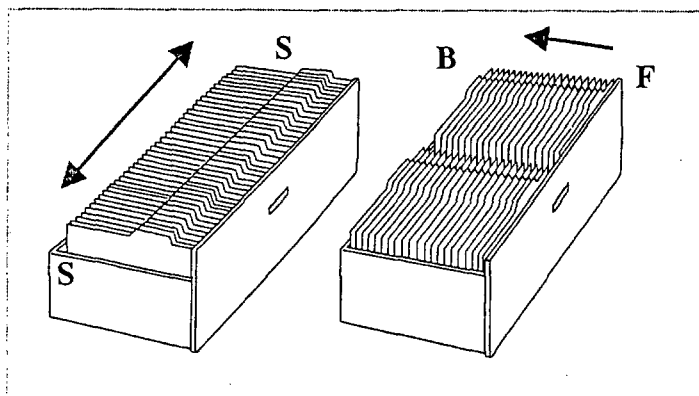


Fig. 7 Types of Folder Arrangement in the Drawer

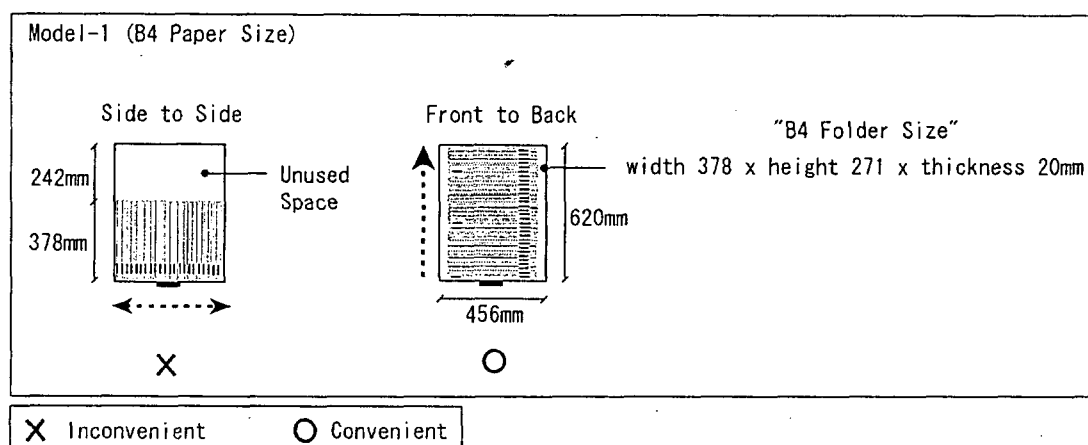


Fig. 8 The Arrangement of Folders in the File Cabinet- Model 1

As for the unit height, it is somewhat different from one manufacture to another. In fig.6 - model 2, the capacity of the drawer cabinet which includes, e.g. three drawers is about 2.7 Fm. The size of drawer fits for S to S and F to B types of file arrangement (whether B5 or B4 paper size).

In the early 1990s, a new size of the file cabinet was emerged within the market (width 800mm x depth 400mm) (Table 2) [33, 45, 35, 32]. The capacity of the cabinet which includes, e.g. three drawers is about 2.4Fm for keeping A4 paper size (Fig. 6 - Model 3).

In the late of 1990s, the file cabinet depth was modified to become again 450mm instead of 400mm (Table 2) [46, 30, 10, 11, 47]. The capacity of the cabinet which includes, e.g. three drawers is about 2.4 Fm by arranging the folders (A4 size) side - to - side and it is about 2.7 Fm by arranging them from front to back (Fig. 6 - Model 4).

Basically, all the mentioned sizes of the file cabinets are still available in the current market.

### 2.3.2 Driving force to modify a file cabinet

This part aims to present and analyze how the designers tried to save the office space for the workers' movement. Furthermore, provide the workers with a convenient space that might be needed for the other activities, such as meeting and discussion areas.

The results of the survey showed that there are two concepts concerning the file cabinets' sizes (Fig. 9): first/early concept is called "independent units" and it was worked from 1950s to 1960s. This concept was built on producing a specific size of storage unit so as to accommodate a specific paper size. Therefore, the early workplace was usually crowded with various sizes of file cabinets which suit various sizes of items including the paper documents. As for the second/modified concept, it is called "modular system" [20]. It is used from 1970s to the present time. This concept rested on uniting the size of the file cabinets (concerning the depth and width) to make one unit. In other words, modular system means that the separate units could be connected together to become one unit.

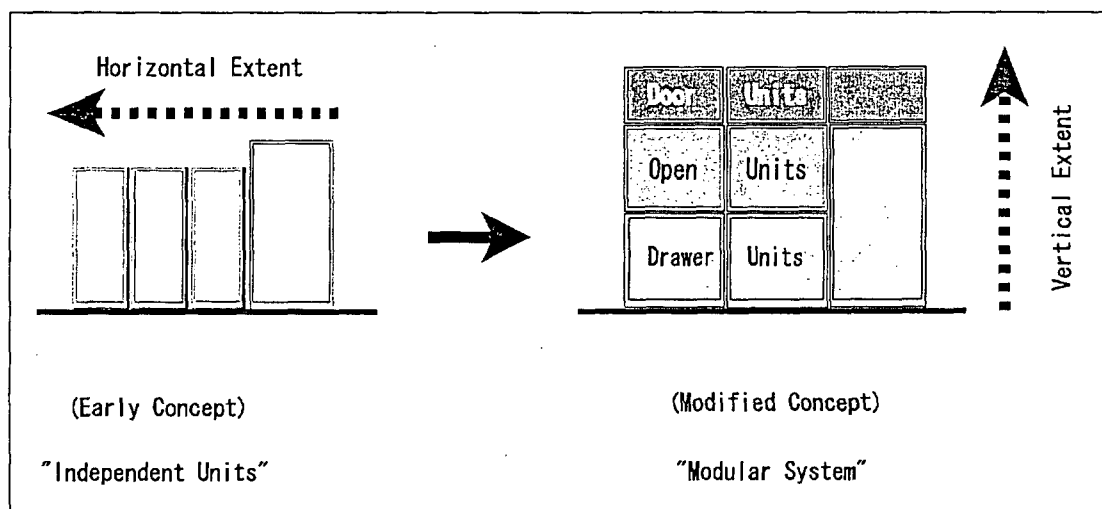


Fig. 9 The Early and Modified Concepts of the File Cabinet Size

- The change from model 1 to model 2:

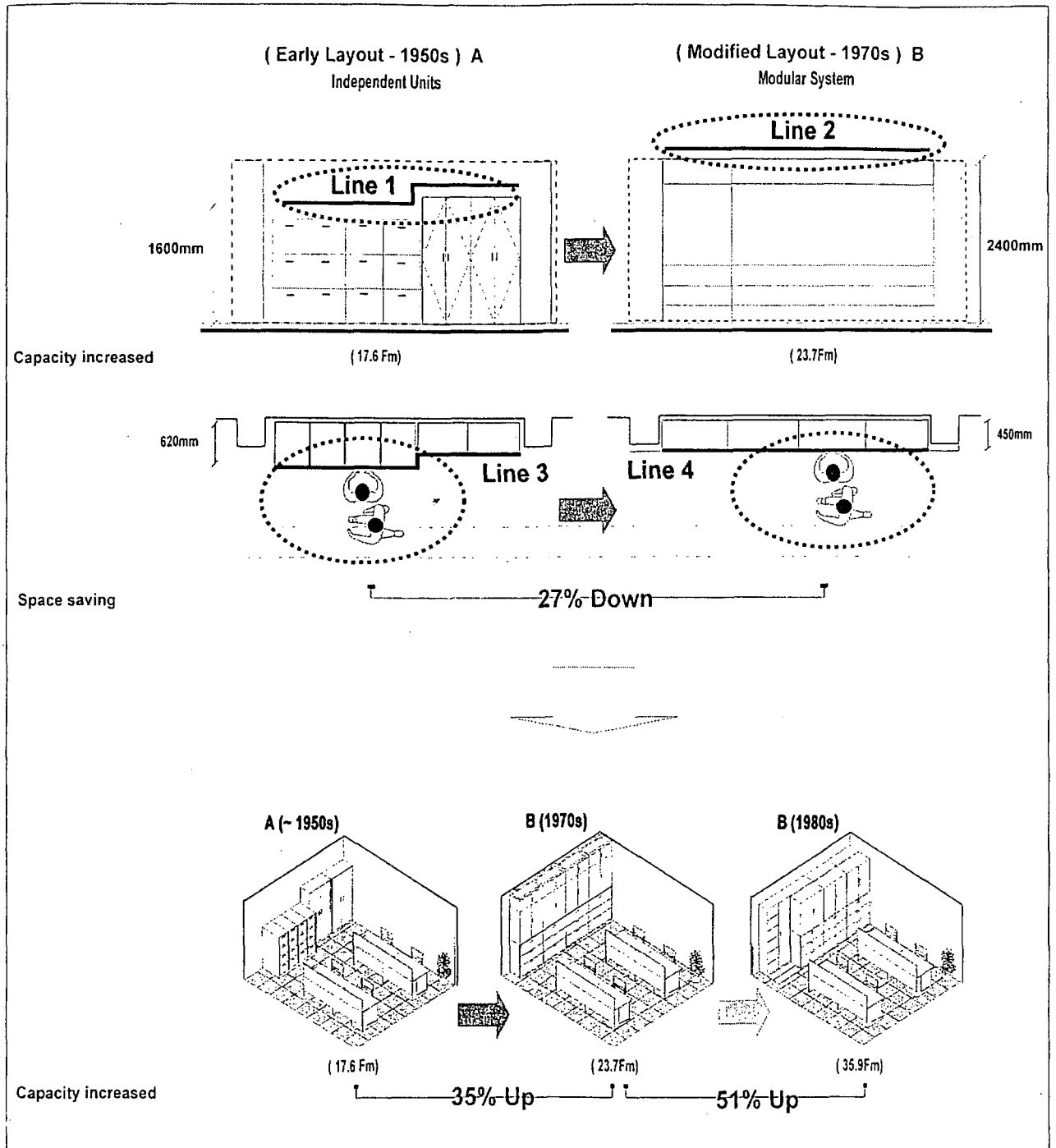
The change from the early concept to the modified one is for the following reasons (Fig. 10): first one is to save the office space which is required for the workers' movement. Since the depth of the cabinet is decreased from 620mm to 450mm, about 27% of the office space is saved. Second reason is to stretch the capacity of the storage unit. However, the horizontal office space that is occupied by the file cabinets in the early and modified layouts is almost same. The capacity of the file cabinets in the latter situation is more than the former one by about 35% [10], as the file cabinets' number in the modified layout are increased by going vertically (Fig. 9). Third one is to be suited with the architectural elements. For example, the column in the modified layout was treated well in order to match with the file cabinet depth (Fig. 10 - Line 4).

- The change from model 2 to model 3:

Based on the survey, we detected that the main reason for decreasing the size of file cabinet model 2 is to save the office space that might be needed for another activities, such as, meeting and break areas. Since the file cabinet size is reduced from width 900mm x depth 450mm to width 800mm x depth 400mm, the saving office space is about 21%. On the other hand, the modified size matches well with A4 paper size (the common paper size used in 1990s). For example, the space between two lines of the file boxes (A4 size) when they are arranged from front to back in the drawer of the file cabinet size width 900 x depth 450mm is about 175mm. But that space becomes about 78 mm in the case of using the file cabinet size width 800 x depth 400mm (Fig. 11). The negative consequences of the modified size (width 800 x depth 400mm) are two points: first one relates to the file cabinet capacity and the second point concerns its application.

Concerning the first point, the capacity of the file cabinet decreased from 2.7 Fm to 2.4 Fm due to the reduction of its size. To overcome this problem, designers tried to increase the drawers' number within the cabinet by reducing the height of each drawer, so that its size accommodates A4 paper size. For example, the drawers' number of the file cabinet model 3 (width 800 x depth 400 x height 1180mm) becomes four instead of three drawers, such as a model 3.1. Therefore, the modified unit capacity (model 3.1) increases about 33% from the capacity of cabinet model 3 and about 19% from the capacity of cabinet model 2 (Fig. 12).

As for the second point, we found out that a worker cannot keep B4 paper size in the file cabinet model 3, as its drawer size concerning width and depth does not fit for the mentioned paper size (Fig. 11). Therefore, the cabinet model 4 was emerged within the market.



Lines 1 and 2 are concerning the height of units  
Lines 3 and 4 are concerning the depth of units

Fig. 10 The Comparison Between the Early and Modified Concepts of the Storage Unit Size

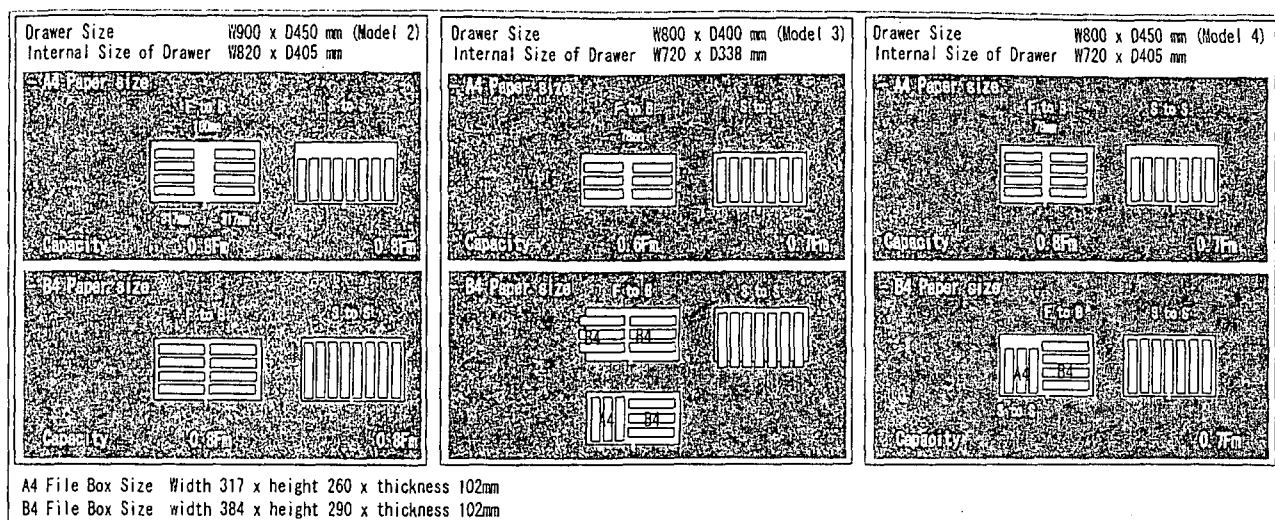


Fig. 11 The Arrangement of the File Boxes in the Drawer

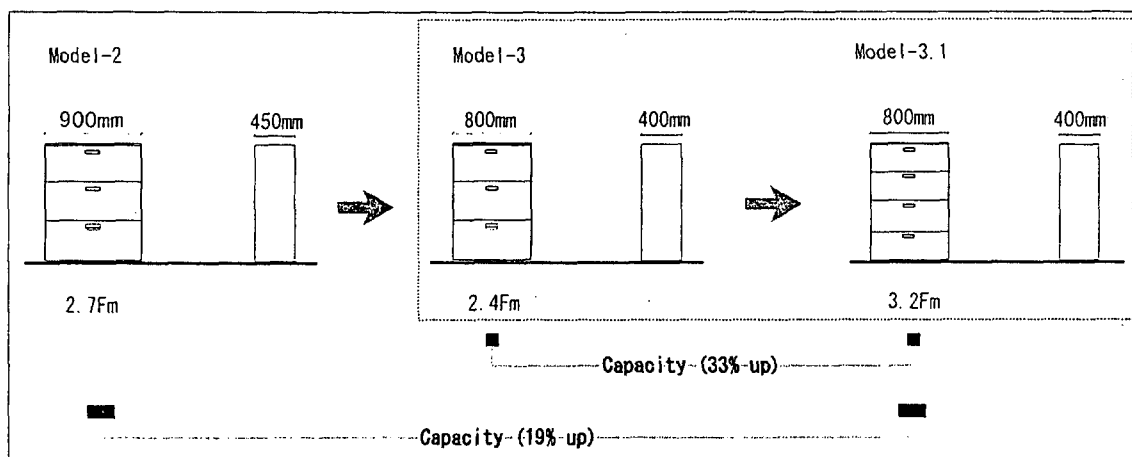
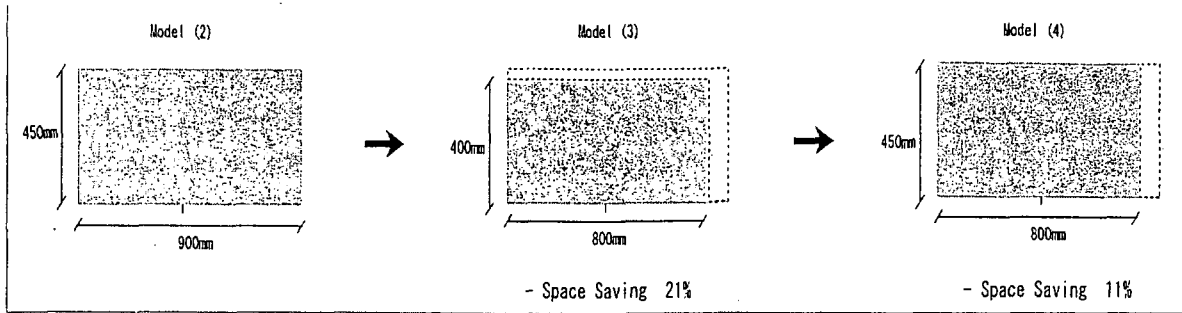


Fig. 12 How to Increase the File Cabinet Capacity

- The change from model 3 to model 4:

The main reason that led to change the depth of file cabinet from 400mm to 450mm is to keep B4 paper size (Fig. 11). But in this case, the office space saving reduces from 21% to 11% (Fig. 13).

Generally, it can be said that the need to change the file cabinet size is for increasing the unit capacity and accommodating the different paper sizes. In addition, designers tried to introduce the unit size which could save the office space and accommodate its architectural elements.



**Fig. 13 The File Cabinet Size Related to the Office Space Saving**

### 3. Conclusion

The results of survey within the Japanese market revealed that the metal storage products are more marketable than the wooden products. In the market, there are two types of the storage products based on their ownership: the personal and communal units. As for the personal storage unit, it includes a pedestal, wagon, vertical unit, shelf, overhead bin, and tray. This study focused on a pedestal to identify and analyze its features and design modifications since 1950s until the present day, as it was used within a workplace earlier than another personal storage types.

A Pedestal has two types in the market: first type is combined with a worktable. Second one is separated from a worktable. First pedestal type has two models:

1. A float pedestal which was marketed in 1950s.
2. A down floor pedestal that was marketed in mid 1970s.

Second pedestal type was marketed in the mid 1980s and it has two models, fixed and mobile pedestal (on the wheels). The important modifications of the pedestal designs concern its size and mobility. The pedestal size is modified for three factors:

- a. An application factor that concerns how to revise the pedestal size in order to accommodate different paper sizes.
- b. The capacity of pedestal is increased in order to match well with the enormous amounts of documents.
- c. An ergonomic factor that concerns how to decrease the size of the pedestal in order to stretch the available space under a worktable, so that a worker can sit comfortably. Moreover, it can be moved simply within the workplace.

Regarding its mobility, astonishing development of information technology industry changes the way of working. New technology creates a mobile office which enables a person to work in the remote settings away from a fixed office. In addition, the idea of workers mobility is promoted also inside a workplace by providing a worker with several spots for achieving different activities (such as, meeting and discussion areas). Therefore, most of the office furniture manufactures emphasis on the mobility of a pedestal in order to serve the workers' particular needs during the work time.

As for the communal storage product, there are several types and sizes of the file cabinet products in the market, such as open, drawer, door, slide, crystal tray, and combination units. The marketable size of the file cabinet is width 800 x depth 450mm, as it is adequate for keeping several paper sizes and convenient for the current office size. The important modification of the file cabinet design from 1950s to the present day concerns its width and depth sizes. This study concluded that there are two concepts of the file cabinet size:

- A. Independent units (1950s~1960s): it is built on designing a definite cabinet size for a definite paper size.



B. A modular system (1970s ~ Today): it is built on standardizing the file cabinet size (regarding the width and depth) in order to connect several cabinets together and get one unit. The intention of this concept is for three benefits:

First one is to save the office space that is required for the other activities, such as meeting and break areas, as well as for easy movement.

Second benefit is to increase the storage unit capacity.

Third benefit is concerning how to modify the cabinet size, so that it could accommodate different paper sizes.

#### 4. Summary

This chapter aims to introduce the available storage systems in the current Japanese market concerning its types, size and capacity. Moreover, it attempted to identify the most important modifications concerning the design of the storage units from 1950s until the present time in order to suit the needs of the present office works. To carry out our aims, four furniture manufactures in Tokyo and Fukuoka were visited as field survey, Kokuyo, Itoki, Uchida, and Plus. We observed and examined the storage products in their showrooms and catalogs concerning types, size and capacity. Furthermore, series of interviews were accomplished with the designers who work in these manufactures. The following are the main results of this study:

1. The storage products are divided into two types according to the ownership of unit: personal and communal units.
2. The personal unit has several types in the market, such as, a pedestal, wagon, vertical unit, shelf, overhead bin, and tray. As the survey revealed that a pedestal was the earliest personal storage used in the workplace, the modifications of the pedestal design from 1950s to the present day was discussed in this chapter.
3. The main modifications are concerning the pedestal size and mobility. The reasons of modifying the pedestal size are to suit different paper sizes and increase its capacity. In addition to provide a worker with sufficient space under the worktable for his/her legs and for putting the computer items.

As for the pedestal mobility, most of the manufactures emphasize on designing a mobile storage units in order to accommodate the current work style which is required a worker to move around in a workplace.

4. Concerning the communal storage unit, there are a wide variety of the file cabinet products in the market, such as, open, drawer, door, slide, tray, and combination units. The commercial file cabinet size is width 800mm x depth 450mm.

The essential modifications of the file cabinet designs from 1950s to the present day are regarding its size for three benefits: first one is for saving the office space that is needed for the office activities, such as, the meeting and break areas and for easy movement. Second benefit is to stretch the storage unit capacity. Third benefit is to accommodate the different paper sizes.

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## **3-2 Propriety of the Mobile Storage Unit for the Work Performance**

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## Part 3- 2

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### Propriety of the Mobile Storage Unit for the Work Performance

#### 1. Introduction

According to the results of part 3-1, we realized that most of the Japanese furniture manufactures emphasize on the flexibility and mobility of the office furniture, e.g. personal storage unit, chair and work table to cope with the current work style which calls attention to the importance of human interaction and the workers mobility during the work-time. As people usually move around the office- either permanently changing workstations or offices within a building or simply collaborating with co- workers, the ability to rearrange furnishings becomes vital.

Today's workplace requires a high level of versatility, mobility and simplicity in the office furniture as the advance of information technology (IT) that changes the concepts of office work [1,2]. Moreover, the attention to the benefit of teamwork and human interaction within the workplace are for creating new ideas and solving difficult problems [3,4]. A new storage unit emerged in response to the needs of mobile workforce. Theoretically, a mobile storage is designed to save the workers' time and effort.

Therefore, this part focuses on its adequacy to perform the different tasks inside a workplace.

#### 1.1 Purpose

The purpose of the present study is to identify the propriety and suitability of the mobile storage unit that is used individually inside the workplace for the work performance.

#### 1.2 Methods

This study was carried out as follows: first, five companies (the same companies that had previously visited in part 2) in Tokyo and Fukuoka were visited as a field survey. In these companies, there are different divisions which have different work types, such as clerical work, creative work and sales work. We selected the workplaces of two different divisions, accounting (clerical work) and design (creative work) because they have same types of storage units. However their work style is different. Second, observation, hearing, and taking pictures were used to evaluate their workplaces including the work style and its effects on the storage systems.

Third, we focused on the mobile storage unit of individual use (e.g. a pedestal) by making a questionnaire for 106 persons (male and female) who work in 10 workplaces

(five accounting division's workplaces and five design division's workplaces) in order to identify its fitness for the work performance. Based on the hearing and observation, some answers for each question in a questionnaire were suggested. Workers were requested to select the answer that accords with their opinions. From seven to ten days, we received the workers' answers. Final results of the survey were determined according to the evaluation of workplaces and the workers' opinions.

## 2. Evaluation of the current workplace

Without doubt, the advance of IT is making remote communication easier and the distribution of information is faster than before [5]. Today, the workplace is equipped with technology and tools designed for communication, data processing and reserving information as well. According to the survey, there are two ways to access communal and personal information within a workplace (Fig.1): way "A" is by using analog media, such as, file cabinets, visual display, duplicated files, and acoustic information. Way "B" is by using digital media, such as, server, electronic screen, electronic tools, and e-mail.

On the other hand, use of IT, such as mobile phones, laptops, Internet and e-mail, office employees become (more footloose) freed of place and time- not only outside the workplace, but also within it. The concept of workers' mobility inside the office building is promoted also by providing employees with different areas that have different characters and purposes to work in and for other activities, such as, meeting, project, break, smoking areas, etc. This way increases the likelihood that people would see each other and talk as they move around the workplace during the course of their daily activities, moreover it makes the most sense to work [3]. As a result, many workers are demanding more flexibility and performance from their products than ever before. They want products that enable, not inhibit their individual styles and processes.

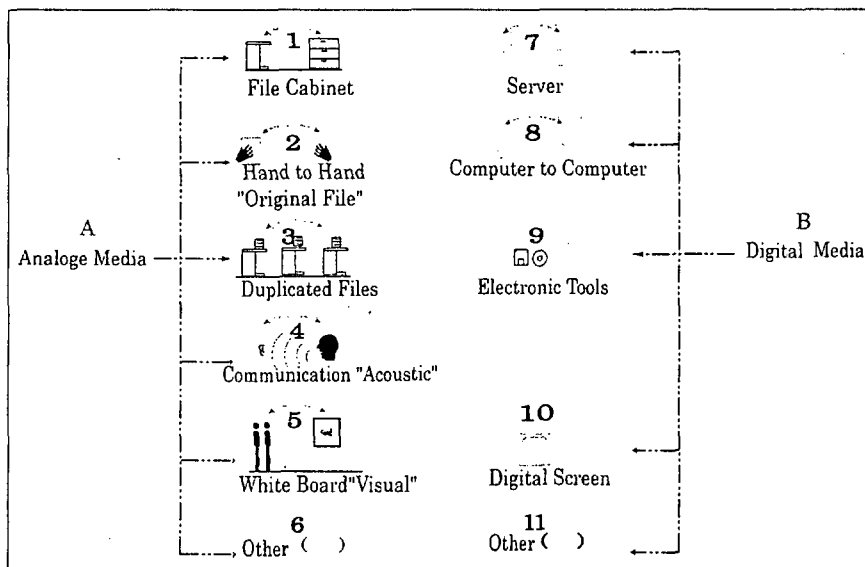
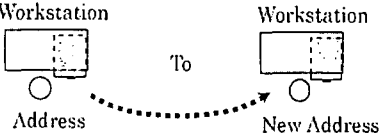

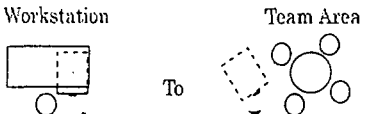


Fig. 1 Different Ways for Accessing Information

Today, office furniture is fitted with castors for flow, and flexibility. A mobile storage unit, e.g. a pedestal is designed so that it can be moved and rearranged easily to fill a wide array of needs, from small gatherings in private working area to group working area [6, 7].

According to the survey that was carried out in the accounting and design divisions' workplaces of five Japanese companies, we found out that there are different possibilities that demand to move the personal storage unit from one place to another (Fig. 2): one is when a person relocates from one address to the new one due to his/her promotion for example. Another is when a person needs to transfer a pedestal from one side to the other one within his/her own work area in order to access the files easily.

The third possibility is when a person needs a pedestal within a team area to access an important document quickly during a meeting or discussion time.

Period	Different Possibilities of Personal storage units mobility *	Division	
		Account	Design
Yearly	1- Relocation (e.g. Worker's promotion, etc.). 	•	•
Daily & Weekly	2- Micro reconfiguration for a worker's convenience. 	•	•
Daily & Weekly	3- Move to the temporary space where groups can meet and present, or work on team projects. 	X	•

• Occur    X Not Occur

Fig. 2 Possibilities of the Personal Storage Unit Mobility

According to the survey, we detected that however the work type has been changed from routine work process to a high level work in many fields of office works (such as, design and planning works) as a result of the information technology development [8]. The clerical works are still influenced by the conventional work style.



## 2.1 Features of the accounting division workplace

Work type in the accounting division's workplace is characterized by routine work processes which are carried out by individuals. Workers are constrained by rules and manuals. The occupancy of space over time assumes one desk per person on a full-time basis. Concerning the office layout, we found out that the conventional Japanese offices and the current one have been designed as large rooms that conveniently allow managers to keep all their staff in sight [8]. Furthermore, this type of office suits for the human interaction that is essential to generate aspects of trust and emotional engagement between the workers [9].

In the Japanese offices - there is a good custom that if a person is busy or has a problem with his/her work, another person helps him/her. This way increases productivity because whenever a problem arises, workers are allowed to stop the line and help a person to solve his problem, without evoking any disciplinary action (see the definition of human interaction in fig. 3). Whether in the current or conventional offices, there is not layout that ignores communications even if the work is private one [8].

Usually informal communication between the workers happens spontaneously (not in a definite place or time). Meeting space is not usually located inside a workplace as the spaces of some offices are crowded with the workers' desks, chairs and machines. Clustered desks are arranged on an "island plan" (Fig. 4). The main difference that is recognized between the conventional and current Japanese offices' layout is that the use of low panels (its height is ranging from 1100mm to 900mm) for workstations in the current one. The intention is to achieve a feeling of privacy for aiding concentration.

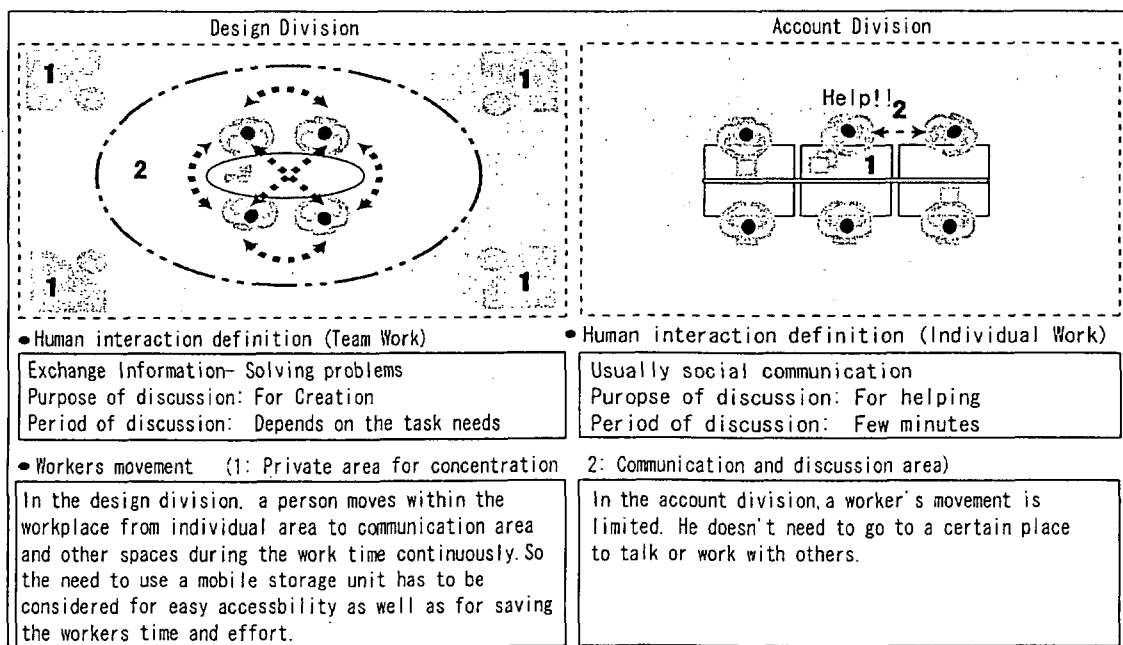


Fig. 3 Definition of the Human Interaction and the Workers' Movement

Concerning the storage system and its influences by the work style which means how people carry out their tasks [10], we found out that there are two kinds of the storage units inside the workplace: first one is personal unit which is used individually, such as a pedestal. Usually a pedestal includes three drawers: first one is convenient for keeping stationery. Second drawer appropriates to keep B5 paper size and third drawer is suitable for keeping A4 and B4 paper size. In some cases, a pedestal has two drawers and both of them are suitable for keeping A4 paper size. Moreover, there are two types of a pedestal: in type A, a pedestal is combined with a worktable (width 395mm~393mm x depth 600mm x height 700mm) (Fig. 5). Concerning type B, a pedestal is separated from a worktable (width 400mm x depth 600mm~580mm x height 610mm~600mm). We observed inside the workplaces that some pedestals of type B are fitted with castors and others are fixed (without wheels) (Fig. 6). In this division, the likelihood of using a fixed pedestal rather than a mobile one might be related to the work type which does not require a worker to move continuously inside a workplace. For example, as the communication and individual areas are located in the same space, a worker does not have to go a certain place inside a workplace to discuss with others during the work time (Fig. 3). In addition, the space that is devoted for placing the personal storage unit is limited as the workplaces are crowded with the machines and furniture. In many cases, each worker is provided with only one pedestal to keep all his files, moreover the personal items. As a result, the movement of pedestal is difficult because it is usually overloaded with documents and supplies.

In three workplaces, we observed that many documents and supplies are accumulated above the machines and under the workers' desks because there is not enough space for keeping them inside the storage units.

The second kind of storage unit is the communal file cabinets which are used by the majority of workers. The communal storage units include low and wall units.

Low unit: there are several types of low unit, e.g. lateral, open, and slide unit.

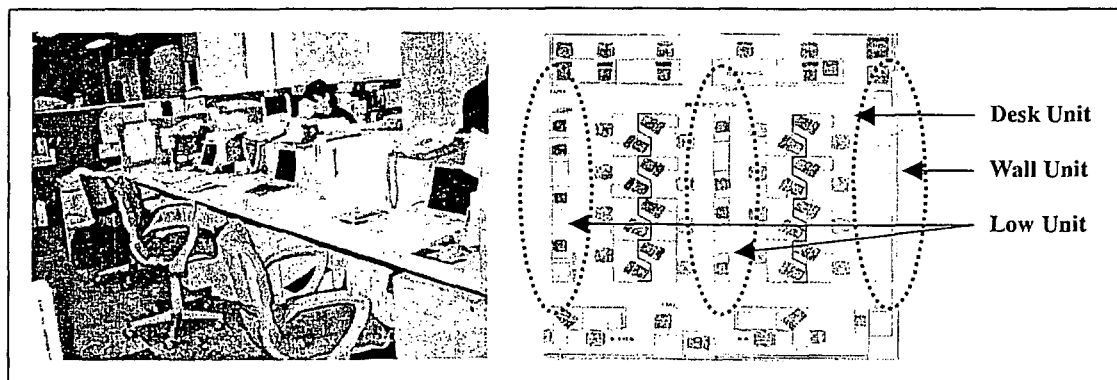


Fig. 4 Current Workplace of the Accounting Division

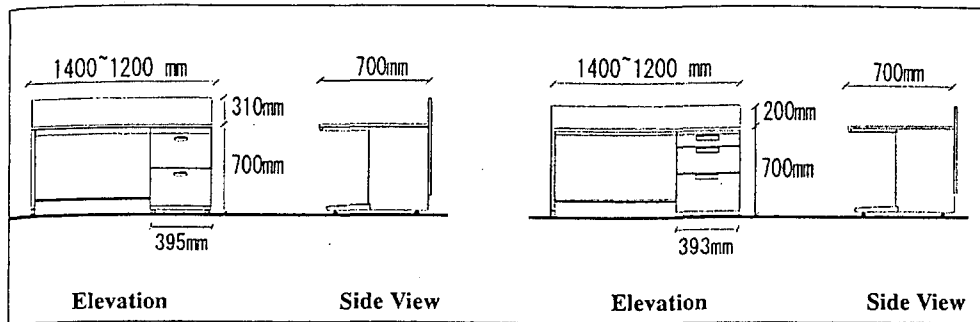


Fig. 5 Combined Pedestal with a Worktable

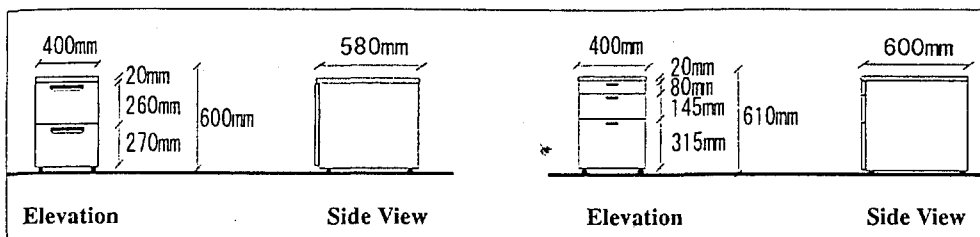


Fig. 6 Separated Pedestal from a Worktable "Either Mobile or Fixed Type"

The size of one unit is width 900mm~800mm x depth 450mm~400mm x height 1200mm, 1050mm and 1040mm (Fig. 7).

Wall Unit: the size of a tall unit is width 900mm~800mm x depth 450mm~400mm x height 2400mm~2100mm (Fig. 8). Both of low and wall cabinets are fixed units (not on wheels), as their sizes are big and they are overloaded with items. In addition, they are usually devoted to the communal use and therefore their mobility is difficult and unnecessary.

## 2.2 Features of the design division workplace

The work type in the design division is characterized by creative knowledge work (the way it's accomplished constitutes a new work process) which carried out by knowledge workers (a worker who primary function in the daily performance of his/her job is analyzing, creating, deciding, collaborating and acting on information) [11, 12].

Based on the survey, we detected that a critical feature in this division is teamwork. Group of individuals work and cooperate together to accomplish an agreed task or address an agreed goal [13-15]. They can tackle more complex problems with more powerful and open-ended technology [16]. Teamwork is necessary for organizations to generate new ideas and thrive [17, 18].

Japanese teamwork helps to make jobs wider in scope and eliminate multiple job descriptions, while emphasizing flexibility, rather than specialization [19]. Therefore, the needs to manage and share information are strongly required in this division.

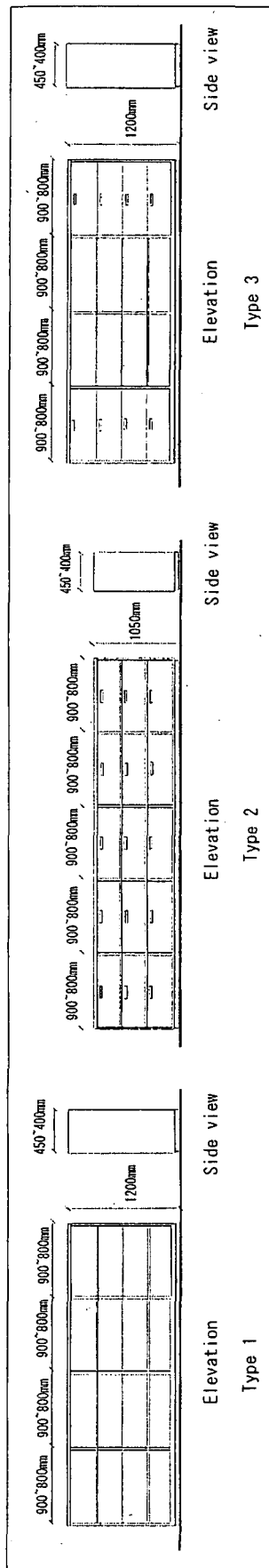


Fig. 7 Types of the Low Unit Inside the Visiting Workplaces

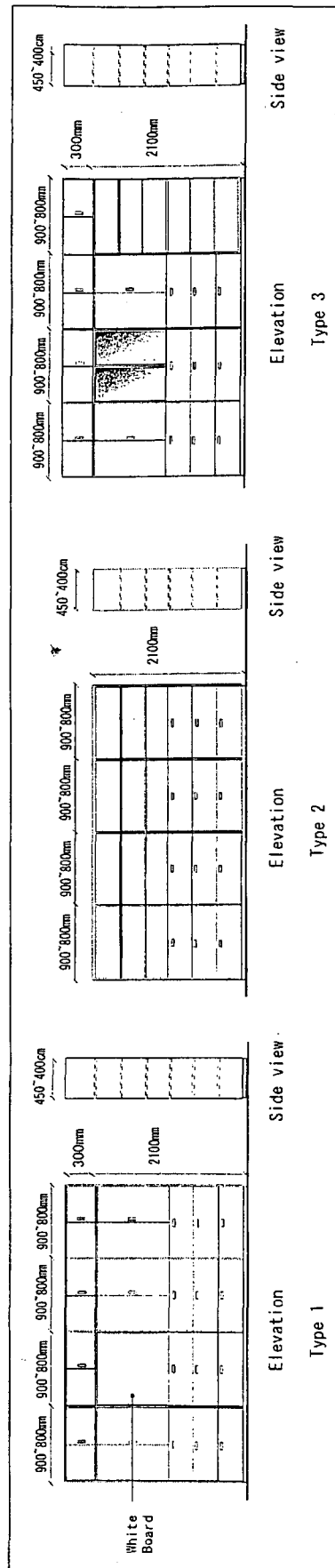


Fig. 8 Types of the wall Unit Inside the Visiting Workplaces

Concerning the office layout, it provides workers with both privacy and communication areas. Workstations are usually arranged facing back - to - back or as it is called in Japan “haimen- taikou” style. High panels are used to facilitate privacy and concentration (Fig.9). Moreover, each group of workers is usually provided with a mobile table for communicating, discussing and meeting continuously with others (Fig.6).

As for the storage units, they are same as the units’ types of the accounting division’s workplace (e.g. pedestal, low and wall units). The differences are that in the design division, there are various sizes of storage unit’s shelves and drawers in order to cope with the papers size and tools of the design works.

In this division, a designer is provided with various types of personal storage units, such as, mobile pedestal, mobile table and panel system including vertical, horizontal trays (Fig. 10) and overhead bin (Fig. 11) because he has items somewhat (e.g. papers, references, electronic tools, samples, design tools, etc.) more than a clerical worker. On the other hand, a few persons usually work in the design division and therefore a space that is devoted for each person is wide enough for placing a lot of storage units.

In the design division, panel is taller than the other one which is used in the accounting division. Its height is usually ranging from 1300mm~1500mm. The intent of this height is not only for offering a person with privacy, but also it could be beneficial for increasing the personal storage space by using, e.g. vertical/horizontal tray.

Concerning the communal units, wall unit is mainly devoted to keep the communal information. On the other hand, low unit is usually devoted to keep documents of the group working. Both of these units are fixed for almost the same reasons that were mentioned in the description of the accounting division files.

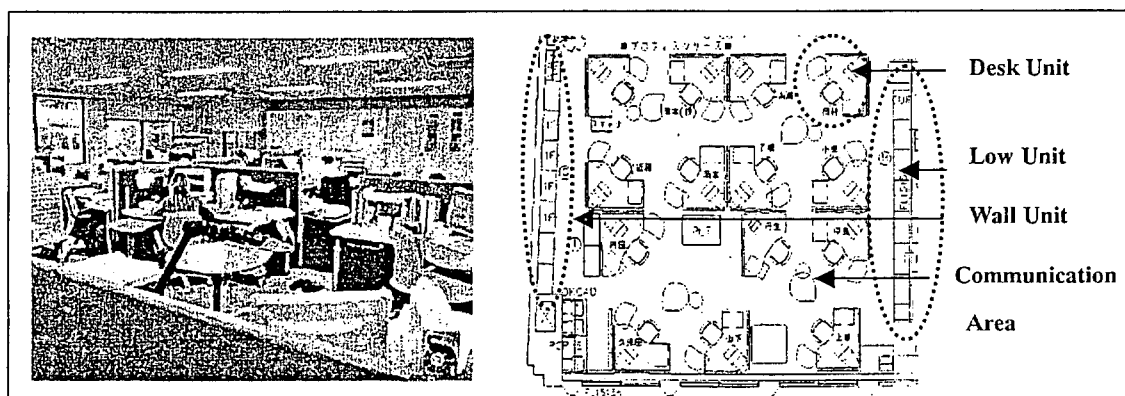


Fig. 9 Current Workplace of the Creative Work

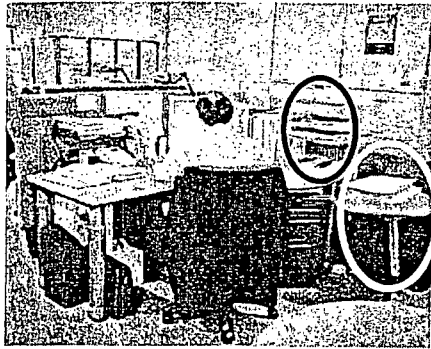


Fig. 10 Horizontal Tray and a Mobile Table

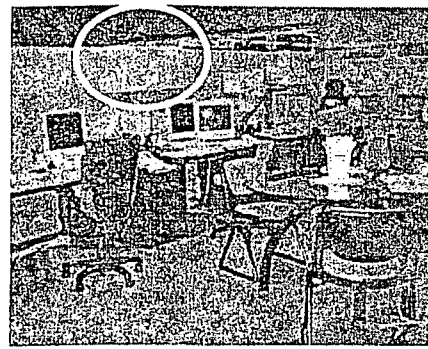


Fig. 11 Overhead Bin

### 3. Results and discussions

The following questions were distributed among 106 persons (72 persons work in the accounting division and 34 persons work in the design division). About 88 persons answered the questions (65 persons work in the accounting division and 23 persons work in the design division). First, we aimed to determine the percentage of existence the mobile storage unit in both those divisions. Second, we focused on the workers' opinions concerning the needs to use a mobile storage unit and its suitability for the work performance. First question belongs to the first part of the questionnaire.

Q.1 Is your personal storage unit (a cart/ pedestal) fitted with castors for easy mobility?

Accounting division's results (Fig. 12):

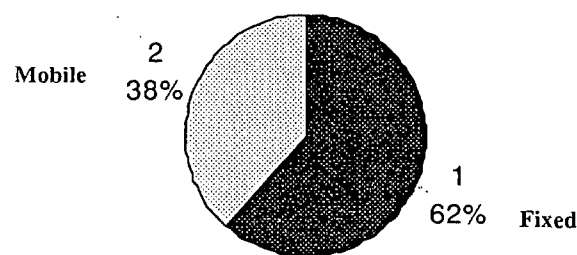


Fig. 12 Personal Storage Unit's Features in the Accounting Division Workplaces

- 1- 62% of workers answered that they have fixed pedestals.
- 2- 38% of workers answered that they have mobile pedestals.

Design division's results (Fig. 13):

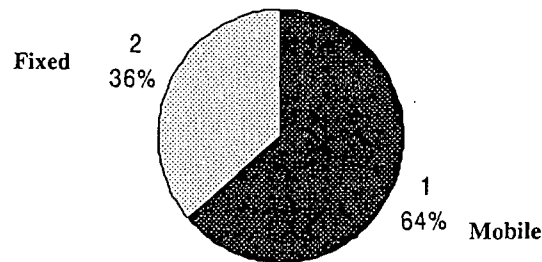


Fig. 13 Personal Storage Unit's Features in the Design Division's Workplaces

- 1- 64% of designers answered that they have mobile pedestals/carts.
- 2- 36% of designers answered that they have fixed pedestals.

Based on the previous results, we found out that the fixed storage unit is still commonly used within the Japanese offices. In addition, the percentage of those using it in the accounting division's workplaces nearly equals twice the percentage of others who use it in the design division's workplaces. On the other side, the percentage of those using a mobile storage unit within the accounting division's workplaces is nearly half percentage of others who use it within the design division's workplaces. The diversity of the percentages is related to some factors. These factors are realized by asking the workers in these divisions about their preferential storage unit (whether a mobile or a fixed unit). Their selections and opinions were based on the importance and adequacy of a mobile unit for the work performance.

The second part of the questionnaire argued the propriety of mobile storage unit for the work performance.

Q.2 Do you think that a mobile storage unit either pedestal or cart is essentially required and convenient for your work performance and your needs?

Accounting division's results (Fig. 14):

- 1- 29% of workers answered that the work type does not require them to move many times within a workplace, therefore a mobile storage unit is not necessary to use.
- 2- 26% of workers replied that a mobile storage unit is essential but as the office space is narrow, therefore its movement is restricted.
- 3- 18% of workers answered that the using of a mobile pedestal enables them to shift its place within their workstations at any time so as to accommodate different demands.
- 4- 11% of workers responded that they move many times during the work-time, so they think that a light and mobile storage unit is needed.

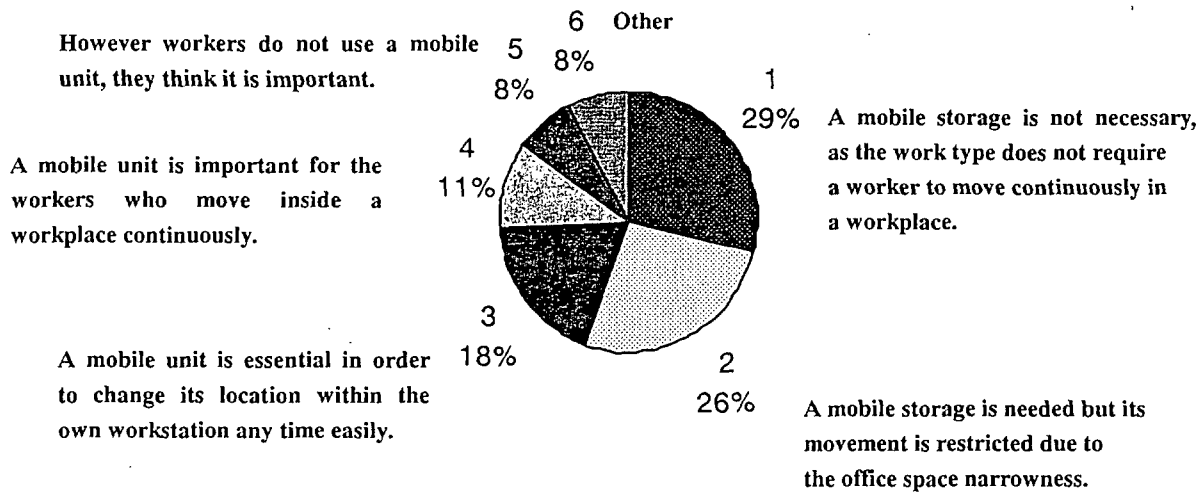


Fig. 14 The Workers' Opinions about the Storage Unit Mobility

5- 8% of workers replied that however they do not need a mobile storage unit, it is important for other situations, e.g. for changing the office layout.

6- 8% of workers selected "other". For example, a mobile unit is often not large enough and its occupancy of space is better devoted to a fixed and taller unit of greater capacity. Others mentioned that a mobile pedestal is not easy to move when loaded full of files, therefore it is not needed.

Design division's results (Fig.15):

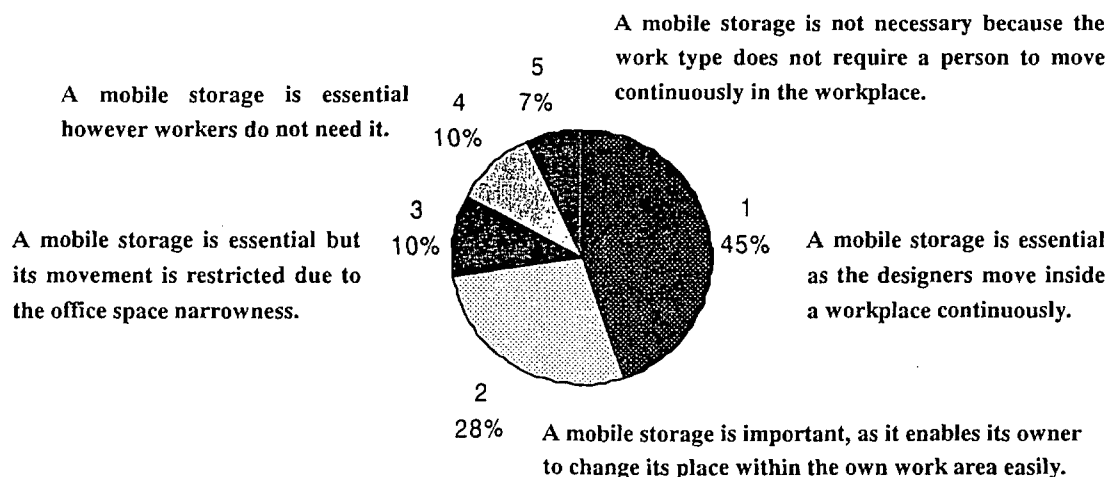


Fig. 15 The Designers' Opinions about the Storage Unit Mobility



- 1- 45% of designers answered that they move many times during the work- time (e.g. during the meeting and the discussion times, etc.), so they think that a light and mobile storage unit is needed to accommodate the different work situations.
- 2- 28% of designers answered that the mobile pedestal enables them to shift its place within their workstations at any time to accommodate different demands.
- 3-10% of designers answered that the mobile storage unit is essential but as the office space is narrow, its movement is restricted. Others mentioned that the office space is crowded with machines and items. Therefore, there is not enough space for moving a mobile storage unit easily.
- 4- 10% of designers answered that however they usually do not need a mobile storage unit during the work time, it is important for other situations.
- 5- 7% of designers answered that the work type does not require them to move many times within a workplace, therefore they think that a mobile storage unit is not necessary to use.

Based on the previous results, we detected that a mobile storage unit is required but in different situations within the workplaces of these divisions.

Actually, its use is influenced by the work style that is considered an essential factor for the person mobility inside a workplace. For example, as a designer's movement inside the workplace is more than the movement of person who works in the accounting division's workplace, the possibility to use a mobile storage in the former division is higher than in the latter one. This does not mean that a mobile storage unit is devoted for using by the group working only but also it is essential for the worker's convenience within his/her own workstation.

Actually, both creative and clerical persons agreed that a mobile storage is needed and critical for the ability to shift its spot within the own work area according to their demands.

According to the survey, we identified that the movement of mobile storage unit in the workplace is influenced by two factors:

- 1- The available office space. Basically, the office space standard in Japan continues to decrease in response to real estate costs and a tight economy, for example, the average work space per person shrunk from 11.21square meter in 1995 to 10.19 square meter in 2001 [20]. Due to this factor, some organizations tend to promote the communal using of storage units rather than the personal using (especially in the accounting division that has more workers than the other one). The intention is to save a space which is needed for easy movement and for the other activities, e.g. break, smoke areas, etc.
- 2- The load of storage unit. Most pedestals are not particularly easy to move when loaded full of files - in fact they are an ergonomic disaster as far as daily mobility is concerned. As it was previously mentioned that a pedestal is often not large enough, and it takes up as much floor space as would a taller unit of greater capacity.

Based on the survey, this study recommends that when we increase the personal storage spaces within the workstation, the quantities of information are kept in the pedestal will be decreased. Subsequently, the possibility to decrease its size will be considered.

In the light of the former recommendation, organizations are required to provide each worker with sufficient storage space within the individual work area. There are many options to increase the personal storage space, such as using a shelf, overhead bin, etc. We strongly support the former approach that reflects on the mobile storage unit's load and size for easy movement, especially in the narrow spaces of office.

The other solution for overcoming the mobile pedestal's problems is by using a portable component (e.g. bag, bin, etc.) of an appropriate size and weight, so that it could be taken along to the remote and narrow places.

Generally, the storage unit's load and the available office space have to be considered before using the mobile storage unit either working with group of people or individual inside a workplace.

#### 4. Conclusion

This part concludes that the need of using a mobile storage unit, e.g. a mobile pedestal has greatly influenced by the work style which considers an important factor of the person's mobility during the work- time. The results of the survey that was carried out in the design and the accounting divisions' workplaces of five companies in Tokyo and Fukuoka revealed that as the movement of a person who works in the design division (e.g. during the meeting, discussion, presentation times, etc.) is more than the other one who works in the accounting division's workplace, the requirement to use a mobile storage unit, either cart or pedestal in the former division is higher than in the latter one. On the other hand, a mobile storage unit is essential for the person's comfort, as it can be changed its spot within the own work area according to his/her needs.

The movement of a mobile storage unit (whether working with co-workers or solo) has influenced by its load and the available office space. For reducing the paper amounts inside, e.g. a mobile pedestal in order to be moved easily, we recommend a worker to use a vertical unit within a workstation, such as, a shelf and overhead bin. On the other hand, when the papers' amount decreases within a pedestal, there is a possibility to shrink its size, so that it could be simply moved whether in the narrow or wide offices.

In the light of this study's results, we detected that however the design of a mobile storage unit offers people the freedom and flexibility to move it around as they wish within a workplace. It is not suitable for some offices' use.

## 5. Summary

The main purpose of the present study is to identify the propriety of the mobile storage unit that is used individually (e.g. cart and pedestal) for the current office. For case studies, we visited ten workplaces of accounting and design divisions inside five companies in Tokyo and Fukuoka to observe and evaluate their work style and storage systems (e.g. its type, size and ownership). Furthermore, we aim to recognize the workers' opinions about the suitability of the mobile storage unit for the work performance.

Based on observation, hearing, taking pictures and making questionnaire for 106 persons who work in these workplaces, the following are the major findings resulting from this study: first, in the workplaces of these divisions, a mobile storage unit is needed but in different situations. The requirement to use it has influenced by the work style that plays great part for the persons' mobility during the work-time.

Second, a mobile storage unit is important for the worker's convenience as it enables him/her to shift its location within the own work area whenever he/she wants easily.

Third, two important factors affect on its movement within a workplace: the available office space and its load. For moving a mobile storage unit easily, this part recommends a worker to stretch the personal storage space within the own work area.

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