TASK ANALYSIS OF CEP SERVICE DRIVERS IN TERMS OF ERGONOMICS AND LOGISTICS

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The CEP markets are growing continuously in most western countries. However, the CEP service drivers are apt to change their occupation due to the poor working conditions. Consequently, one of the goals of the project, "ParcelMan", is to implement an improved and more efficient working system in the CEP industry, coping with these new trends. A task analysis of the CEP service drivers was carried out in order to identify the current CEP service system and its problems. Six professional CEP drivers were observed for about 33 hours in total. A new electronic observation method, the "FIT SYSTEM", was used in addition to the traditional paper and pencil method.

The results of the observation showed that the CEP drivers tried to keep delivery time to a minimum in order to meet deadlines by performing parallel activities while driving. Accordingly, many organizational and safety problems were observed, and possible solutions and recommendations to improve the current working conditions were proposed.

INTRODUCTION

The CEP (Courier, Express and Parcel) markets are growing continuously every year in most western countries (Stich, 2002). For example, in Germany, the number of shipments in the CEP market increased from about 1.35 billion to about 1.66 billion (23%) between the years 1995 and 1999. The gross income of the German CEP market increased even further from 7.3 billion Euros to 9.7 billion Euros, which equals an increase of about 33%, during the same period (Manner-Romberg, 2001). This growth trend in CEP market is expected to be maintained or increased even more by the development of information technology. Even today, it is quite common for the customers to check and buy the products using the internet or mobile telephone, and then CEP service companies deliver the goods to the customers.

In addition, the customers of the CEP market these days expect better services from the service providers, including guaranteed delivery times, smaller delivery time slots and same-day deliveries within a few hours, yet show a low tolerance for extra cost (Cremer, 2001 and Stich, 2002).

At the same time, the CEP companies are undergoing a high employee turnover especially among delivery drivers, owing to prevalent part-time positions and relatively low wages as well as physical and mental stress in the industry (Stich, 2002).

Due to these market growth and high expectations from the customers, there have been attempts to improve conditions in the CEP service system. The project, "ParcelMan", is trying to satisfy the demands of changing CEP business by implementing a better and more efficient working system in the CEP industry. Another goal of the project is to improve the work environment in order to meet the needs of the workers in this area.

A task analysis of CEP service drivers was carried out in order to diagnose their working situations and problems and to identify the direction of the studies for implementing better working conditions and efficient ways of working in the CEP industry.

METHODS

Six professional CEP service drivers between 26 and 35 years old volunteered for the observation. The observation was carried out for about 33 hours in total. Office work period, which they performed after they had made deliveries for the day, was excluded from the observation. Three of the participants were part-time workers who were not office work. A new electronic observation method, the "FIT SYSTEM" (Figure 1), was used as well as the traditional paper and pencil method. Afterward the observations, the results from the both methods were combined and analyzed using Microsoft Excel. 18 activities were predefined based on the findings of the preliminary observation (Table 1). With FIT SYSTEM, the observer must only click the predefined area on the touch screen of the Palm PC with the stylus (Figure 1), time and type of activities are then recorded in the memory of the Palm PC. The data can be transferred to a PC by FIT manager system and analyzed with a specially designed Excel worksheet. For the paper and pencil observation method, the observers write down the activities and the time using a stop watch.

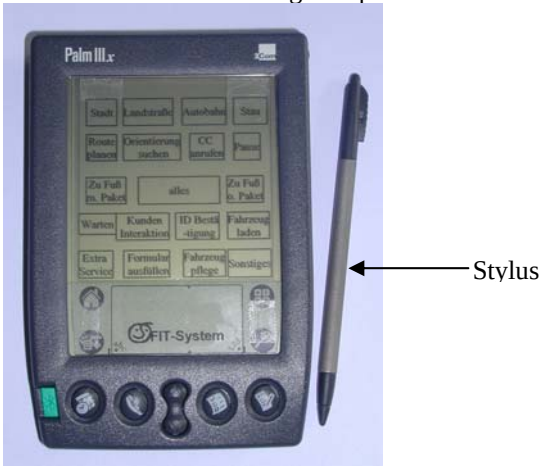

Figure 1. FIT SYSTEM, integrated into a Palm PC.

Table 1. Definitions of activities of the CEP drivers

activity	Definition
Route plan	Planning the route in the delivery station
City	Driving in the city
Country road	Driving on the country road
Highway	Driving on the highway
Traffic jam	When vehicle stops or moves very slowly due to traffic jam
Route finding	Route finding or searching activity, such as checking map, house number or asking people
Telephoning	Time spent on the phone
Walk w. pack	Walking or standing with package
Walk w.o. pack	Walking or running without package
Un/load	Loading or unloading the packages
Wait	Waiting in front of customers door
Conversation	Talking with customer about things, not related to the delivery process.
ID confirm	All activities related to ID confirmation
Extra service	e.g. explaining, installing, repairing, etc. goods for the customer.
Maintenance	Cleaning, getting fuel, repairing vehicle, etc.
Documentation	Filling out forms
Break	Taking a break
Miscellaneous	All activities, not defined above

Work process of CEP service

The companies where the observations were carried out belong to the category of small- and medium-sized companies and are subcontractors of German logistics companies. They provide delivery services for the contractors as well as for individual customers. The delivery service provided by the companies, can be mainly divided into two categories: delivering or picking up the packages or letters. In the beginning of the delivery process, the drivers plan the routes and decide the delivery order according to the location of the customers and the time window. Currently, they have to deliver certain goods during a pre-specified period of time. For instance, some packages should be delivered between 8 and 10 o'clock, others between 10 to 12 o'clock, and the others between 16 and 19 o'clock. The drivers are responsible for delivering the articles within the specified time frame. Then, they prepare the vehicle by loading the packages, cleaning, and getting fuel, etc. and then drive to the customers. After delivering the goods assigned by the main contractors, drivers are required to report the success or failure of the delivery immediately to the call-center of the contractor, and get the confirmation codes from them on the phone. When they deliver the parts of certain products, they provide extra services, such as installing or exchanging parts, referred to as "value-added services". If they pick up the packages from the clients, they usually bring them back to the delivery station after each time window. Occasionally, they spontaneously get the orders on the phone from the delivery station to pick up the goods, in case, they are on the way to or near from the place of the new delivery order. After coming back from the delivery, they organize the packages, fill up the forms, and copy the documents.

RESULTS

The task analysis was carried out for more than 33 hours 24 min. of the delivery process. Each driver had an average of 12 customers and drove the vehicle an average 153 km per day. They spent 29 min. and 3 sec. for each delivery process, and 2 min. and 5 sec. with each customer, on average. The average distance between the customers was about 13 km. The CEP drivers were engaged in the outside delivery process for about 5 hours 34 min. per day.

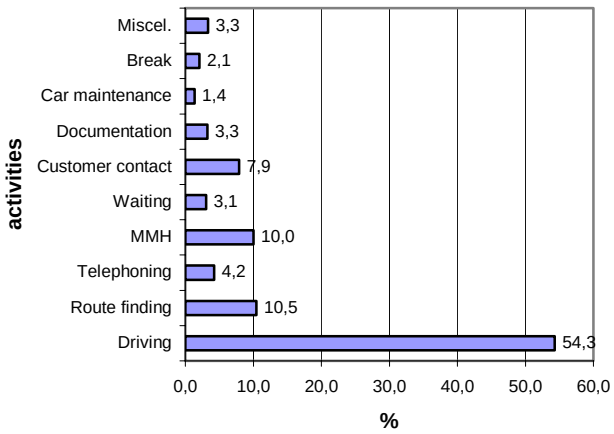

Figure 2. The CEP drivers' activities in percentage

According to the observations (Figure 2), CEP drivers spend most of their times for driving the vehicle, more than 54% of the entire working hour. They usually have very little time for taking a break, 2.1% during the observation, because they are always in a hurry to meet the delivery deadline. In other words, for every six hours of time spent making deliveries, each driver stopped the vehicle to take a break for 7 min 30 sec on average, although CEP drivers are officially recommended, by the companies, to take at least 30 min of break per day. The drivers tried to find some time for eating, drinking, or smoking, while driving. They also frequently checked the map in order to find the exact destination and telephoned with the delivery station while driving, during approximately 7% of the driving time in total (Figure 3).

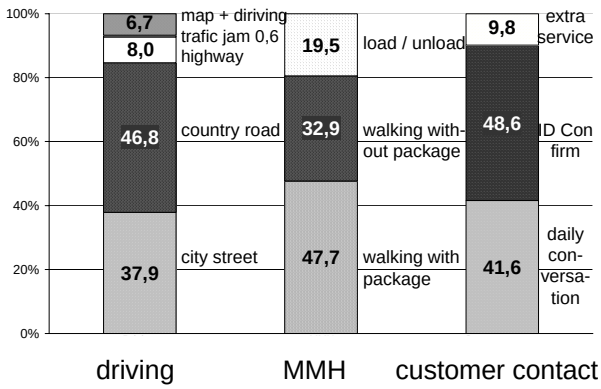

Figure 3. Specified activities of the CEP drivers

However, in most cases of telephoning activity, they had to stop their vehicle in order to make a phone call, because they must write down new delivery orders from the stations and confirmation pin-codes which they receive on the phone from the call-center as evidence of delivery confirmation (Figure 4).

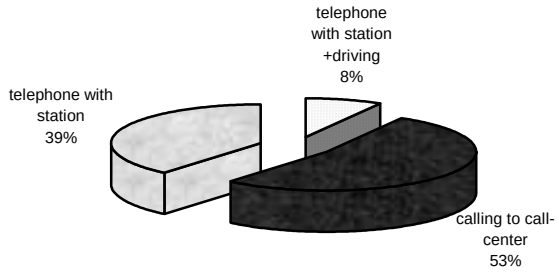

Figure 4. Specified telephoning activities

Generally speaking, they spent about 10% of time for route planning and seeking the destination, another 10% for manual material handling, such as carrying the package manually, loading and unloading the packages. They also spent about 8% of their time with customers and 3% waiting for the customers. Telephoning occupies 4.2% of the delivery process, and the documentation takes 3.3%. The drivers usually get gasoline and clean the vehicle early in the morning before they start on their route, which takes 1.4% of entire working process on average (Figure 2).

The size and weight of the packages varied from a small box for a mobile phone to a box of very bulky and heavy industrial equipments, which sometimes weighed more than 80 kg, according to the interviews, twice per month. The limit for the weight of a package is 160 kg according to the company's regulations. However, in most cases, the drivers carry an average package of 5kg with the size of $30 \times 20 \times 10$ (cm).

According to the interviews with managers and drivers of CEP industry, following are requirements to be a good CEP driver: driving skill, map reading skill, friendly attitude toward customers, knowledge of certain areas, capability to interact with customers, knowledge of certain technology equipments, which the drivers deal with.

DISCUSSION

On one hand, as Stich (2002) pointed out, the CEP drivers seemed to be working under difficult circumstances, such as a low salary, demanding job and mental stress due to the short delivery time frame. However, on the other hand, the drivers were positive with the fact that they have freedom in decision making and can work independently during working hours.

It seems that the drivers are involved in MMH, only 10% of the entire working time in Figure 1, but the manual handling during the delivery process seemed to be quite intensive, since they are always in a hurry. It was very often observed that they are almost running or walking fast whether they leave their vehicles with or without packages. Moreover, from time to time they need to carry very bulky and heavy boxes, which are almost impossible to be carried by one person, such as a box of 80 kg. In that case, they usually get help from the client. In addition, it should be noted that the walking time with packages took much longer than the time without packages (Figure 3), although they walked almost the same distance for "with package" and "without package". This indicates that the weight of the packages is a significant factor in this job.

When the drivers meet their customers, they seem to spend quite a lot of time (about 42% of the customer contact time) engaged in daily conversation (Figure 3). However, it is considered necessary and useful to be friendly to the customers and it could be lead to an improved company image.

The specified driving pattern could be different depending on the time, region, route plans, and individual character of the driver. For instance, the percentage of traffic jam would be increased significantly, if the delivery must be made during rush hour and the delivery plan is concentrated in the inner city. Also, depending on the drivers, some prefer country roads to highway and vice versa.

The important point with relevance to the driving activity is that the drivers carry out other activities parallel to driving. For example, during about 7% of the entire driving performance, the drivers were holding and checking the map without looking at the front or paying attention to traffic. Other activities, such as eating and telephoning, were also observed frequently. Those additional activities carried out while driving could be risky and dangerous, because it could distract the drivers and reduce their reaction time.

Then, why do the drivers make such an effort to save time? This is because they cannot foresee exactly what is going to happen with the next client. The traveling time need to reach a customer can increase greatly and unexpectedly due to changes in road conditions, such as a traffic jam, or road construction, or the delivery personnel might need to spend more time with one client because the client needed more information (value-added service – the driver should not only provide the delivery service, but also satisfy the customers in many respects). Another time-consuming situation involves waiting for customers who are not available at the time of delivery. The driver might need extra time to find out the exact locations of the customers. To prepare for such unexpected situations, the drivers try to save time whenever possible, since they have the responsibility when a delivery is not made on time.

The drivers were frequently observed trying to save time by carrying out parallel activities, such as "map checking + driving", "telephoning + driving", or "eating + driving", in order to meet the delivery schedule. This indicates that they are struggling to keep within the delivery time frame in current working situations. In other words, without improving the organizational system and providing the drivers with technical support, such as a voice-controlled navigation system and so on, it might be risky to narrow

down the delivery time frame as it is being planned in the logistics market.

In the CEP industry, the experienced drivers who have served in the same area for a long time can be a good asset for the company, because they know a lot about specific situations, including traffic situations, street names and people. It means that it would be easier for them to anticipate the entire delivery process and organize it optimally. In that sense, the current working environments of CEP drivers, which cause the drivers to change their jobs easily, should be improved, in order to attract more experts to stay in the CEP service area.

In some small- and medium-sized delivery companies, there were some trucks with no measures to fasten freights in the freight section. Consequently, the freights move around whenever the trucks start, turn, and stop. The simple modifications in the freight sections, e.g. installing an attachable net or separation bars, are recommended in order to secure the fragile freights and the safety of the drivers.

The data collection method using FIT SYSTEM seems to be more convenient and accurate than the paper and pencil method for this type of observation, because some activities of the drivers happened suddenly just for some seconds, so it was difficult to write down exact time and activity. Also, during most of the observation period, the drivers were almost running or driving the vehicle, it is difficult to write down something in the moving vehicle or following a running person. In those aspects, it was easier to use the FIT SYSTEM, since the time and the activity were recorded automatically by clicking. In addition, the time needed to transfer the data was saved. However, even with FIT SYSTEM, paper and a pencil were still used in order to record unexpected situations.

Limitation and Recommendation

Due to the limited number of participants and observation time, further studies with more participants from the different delivery stations are required, in order to generalize the results of this study. Furthermore, the natures of the delivery process, such as mobility and unforeseeable variables, made the observation difficult.

With the current delivery system, it is very difficult to reduce the delivery time. That is one of the reasons why the CEP drivers are carrying out parallel activities, especially while driving. Changing the organization system could be one solution to reduce the delivery time. As Stich (2002) proposed, more flexible and dynamic organization structure of CEP business may be more efficient, reducing the time for waiting for customers or finding routes and customers. However, there is still high possibility for the drivers to perform parallel activities with the dynamic CEP delivery system. Therefore, without supporting the CEP drivers with proper technology equipments, the risk of accidents and safety problems would still dangle after the CEP drivers.

Although CEP drivers are currently provided with some preliminary job training including product training, it would not be enough for the future CEP drivers who are going to provide value added services by working creatively and independently. Appropriate technology training should be provided in order for the drivers to handle technology equipment that they use in a newly designed delivery system, and to deal with new technology products that they explain or install for customers.

Furthermore, proper safety training should be provided to the CEP drivers to protect themselves from occupational illnesses, with relevance to the safe working methods, including the safe way of carrying heavy things, how to minimize the risks, and so on. Service training is also necessary, because they need to deal with many types of people and situations, and to provide friendly and good impression to the clients in any case.

In addition, the CEP drivers should be provided with a carrier with wheels, in case they need to carry any bulky or heavy boxes. Although carrying heavy or bulky packages happens once in a while to the drivers, the occasional heavy lifting and carrying can also cause muscular-skeletal disorders to them.

According to the interviews with the CEP drivers, they seem to get much mental stress from the time pressure of keeping the delivery time frame. Therefore, it would be interesting and worthwhile to check the relationship between the time pressure and the mental and physical stress of the workers through the laboratory experiment.

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