

USING THE OBSERVER FOR ERGONOMICS RESEARCH

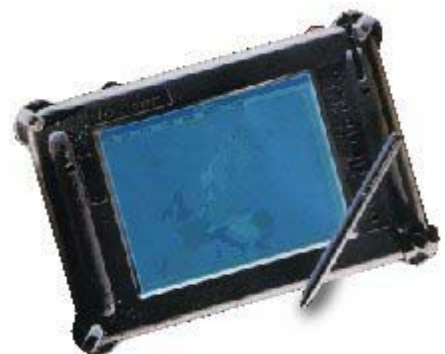
It is 6 a.m. at Amsterdam Schiphol airport. A flight has just arrived from the far East packed with tanned tourists who are happy to be safe back home and see their relatives again. For the KLM staff this is a critical moment of action to get the plane prepared for its next departure. The plane has to be unloaded and reloaded in an orderly fashion to ensure that it leaves for its next destination at the scheduled time. For this to be done as quickly as possible, the process requires precise control. Noldus News staff writer Jessica Sweens went to have a look.

Observing and controlling

As civil air traffic is rapidly growing, most large airports are under constant reconstruction and expansion. This also applies to Schiphol Amsterdam Airport. In order to minimize waiting times before departure and between connecting flights, the ever-increasing stream of airplanes, passengers and luggage must be led into the right channels. To this end the KLM Controllers Service Management Schiphol is constantly analyzing the processes related to the arrivals and departures of the aircraft, i.e. all the passenger-related activities. Each and every activity has been allocated a certain standard duration based on the time and the work force needed to fulfill a certain task. For example, specific time allotments have been assigned to activities like transferring baggage, loading baggage, refueling the plane, etc. When a specific process has been changed the KLM has to investigate and, when necessary, adjust these standard durations.

"Until now we observed and recorded all these activities with paper, pencil and stopwatch, not quite verifiable and accurate", says Tjerk Hempenius, researcher for KLM Controllers Service Management Schiphol. "It was very cumbersome because the checksheets get wet when working outdoors and the data transcription is very time-consuming. Therefore, we started looking for a flexible software package for data collection and analysis, supporting both continuous and interval sampling, which would allow us to prepare a new time study in a short time and to produce analysis reports directly after data entry. Furthermore, the event recorder should be a robust portable computer, able to withstand the rough conditions under which we sometimes have to work!"

The optimal combination was found in The Observer 3.0 Base Package for Windows and the Kalidor K2100 pen computer. The Kalidor is a water-, shock- and dustproof mobile unit, based on a 486 processor and running Microsoft Windows for Pen Computing. Its large display and full day of battery life makes it an excellent data-entry workhorse. To accommodate KLM's specific needs, several additions were made to the software, such as the ability to express durations in centiminutes and the confidence interval of the mean duration as an extra analysis parameter.



Observational study of flight activities

Recently, Hempenius and his colleagues used The Observer to determine how the various flight activities are registered by the flight handlers. Before the plane can depart for its next destination several activities have to be done and need to be checked before it can leave. Hempenius explains: "A number of flight handlers, each behind a computer, receive information throughout the day that has to be registered. You can imagine that a plane cannot leave until the load is correctly stored; it has to have the necessary amount of trip fuel, the total number of passengers has to be correct as well as the weight of the luggage. The flight handlers need to check if the data of all these activities are correct. In order to gain a clear understanding of this process, the flight handling department has

asked us to perform a time study of this process. Practically seen, we observed one flight handler at a time to get a full overview of his activities during the day."

Before the actual observations could start, a comprehensive configuration had to be set up in order to recognize and score the different activities. Hempenius noted that they had to overcome several obstacles while designing the configuration. The basic bottleneck was the complex process of checking and registering the activities of planes departing at different times. The flight handlers receive a number of flights during the day but they do not know when. A related problem is that flight numbers continuously switch; each time a new flight comes in the previous flight registration has to be interrupted to start checking the fulfilled activities of the incoming one. This continues until all the performed activities with every departing flight are controlled and registered. For example, a Boeing 737 to Athens departs and the flight handler starts to collect the relevant data and to prepare the necessary loading activities. While he is busy checking the activities, another plane to Moscow departs and he has to quit his present check-up to make a start with the flight to Moscow.

Within the configuration for The Observer, the different flight numbers could be recorded within one channel to establish mutual exclusiveness, but this was not an option as the numerous flight numbers change almost every day. This would involve adjusting the configuration each time a new observation was started, which is too time-consuming. Before Hempenius and his colleagues figured out the optimal configuration they had to change their original approach. They found that recording the different flights as independent variables that could be adjusted before, during and after each observation was very impractical. Furthermore, it was not possible to define the different flights as subjects because only one flight is handled at a time. Instead, they found that approaching the flights as behaviors, which form the behavioral elements of one behavioral class named 'Setting up the loading plan', was much more feasible. The activities that need to be done are divided into 'load planning' and 'gate handling', which are defined as a combination with each flight. This resulted in 10 behavioral elements: flights A through E for load planning and flights A through E for gate handling. In order to fine-tune the 'load planning' and 'gate handling' activities they made a modifier class for each type of activity. Each modifier class links to the corresponding behavioral elements, thus the activities of the modifier class 'load planning' refer to the combination flight-load planning. This configuration enabled them to easily score the registration activities of the flight handlers. Additionally, they decided to use a continuous observation based on the focal sampling method with a flight handler as the single actor. Hempenius describes an observational session as follows. "For example, we are observing a flight handler who just received the sign to start the registration of a plane to Rome (flight A). We start the observation and score his first activity, positioning the items in the plane. Flight A is scored as behavior and the positioning of the items as modifier. The actual observations worked out fine once we were satisfied with the configuration. In order to analyze the results we decided to use the Time-Event Plot procedure, as this turned out to be the easiest method for our situation. We are now able to set up a plan to increase the efficiency of flight handling and subsequently adjust the standard duration.

Unloading airplanes

The decision to use The Observer originated from the need to optimize the process of unloading and loading an aircraft after arrival. As soon as a plane has landed, the different belly compartments need to be unloaded and subsequently reloaded with luggage, cargo and postal packages. All activities which take place from the moment the plane arrives at the platform to the moment the baggage is carted away to the terminal are observed and recorded. The crew in charge of 'receiving' the plane opens the cargo compartment, drives a train of baggage cars to the plane and unloads the baggage from the aircraft on the cars.

At present a trainee has been assigned to observe these procedures in order to assess the ratio between luggage, cargo and postal packages in an airplane. For example, the belly compartments of a Boeing 737 passenger aircraft are never completely filled by the luggage of its passengers. Therefore it is necessary to determine what space is available for cargo and postal packages. Based on the outcome of this observation the load department, which is primarily involved with passenger luggage, charges the costs for loading other material to the corresponding divisions.

Conclusions

Hempenius summarizes: "The Observer is effective as an observational tool for the KLM as it really helps us to improve and quicken the observations we need to carry out. It is now much easier to hand over observational activities to a colleague, something which was difficult when using pen and paper. Furthermore, The Observer enables us to accurately measure who does what, at what moment and for how long and draw conclusions about possible bottlenecks in the process and formulate recommendations to optimize the process."