ERGONOMIC WORK ANALYSIS FOR THE DEVELOPMENT OF A TELEMATICS APPLICATION FOR MEDICAL ASSISTANCE

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1. Introduction

Medical assistance can be defined as an aid, provided immediately to a person having an unexpected medical problem. Assistance companies provide medical assistance to their clients all over the world. When a medical problem occurs to a client away from his residence, the assistance company has: (i) to monitor his health status, (ii) to decide on the eventual on site treatment and/or his repatriation, (iii) to organise the repatriation procedure of the client and accompanying persons, and (iv) to deal with the resulting costs.

To carry out these tasks, assistance companies co-operate with local (on site) correspondents and health institutions. A heavy amount of information exchange among these three agents is required in order to facilitate decisions and perform the necessary actions for the well-being of the patient. Currently, the information exchange is mainly done by fax and telex messages or less frequently through telephone.

The aim of the present project is to design a system supporting the execution of medical assistance, compatible with Electronic Data Interchange (EDI) technologies. The Assistance domain called for an improved co-operation between the different agents, a decrease in the cost of information exchange, and an increased reliability of data transmission.

This paper presents the work analysis carried out at the front-end stages of the development of the system, i.e., user requirements analysis and functional specification of the system. The theoretical foundations of the adopted methodology was inspired by the Ergonomic Work Analysis of the French language ergonomists (Wisner 1995, De Keyser 1991, De Keyser et al. 1988) as well as by the concepts of Cognitive Engineering (Woods and Roth 1988, Rasmussen 1986).

2. The Work Analysis carried out

The user group of the project consisted of 9 local Assistance providers mainly in East European countries and 2 larger Assistance companies based in Germany and in France. A problem that the work analysis had to deal with was that the 11 different organisations involved had similar objectives but distinct work rituals and methods and were operating in different environments.

Medical assistance cases have the particularity of being unique, showing a strong diversity (as most medical cases do) and cannot be sufficiently described by one or few ‘normal’ scenarios. The absence of widely applied standard procedures in present day practice demonstrates well this difficulty.

The pre-analysis carried out evidenced also that standard checklist forms are (almost) never used for the messages exchanged between different agents. The reason is that ‘standard
forms” cannot account for the complexity of the work (for example, one cannot clearly
distinguish medical from administrative information or decisions), the variety of the
encountered situations and time constraints.

Having in mind these requirements and constraints, the work analysis was carried out
at all 11 organisations with the aim to identify: (i) information exchanged and information
flow, (ii) organisational issues such as formal and informal procedures, official and unofficial
roles/responsibilities of involved human agents, (iii) normal and marginal situations, and (iv)
confidentiality issues. The methods used for data gathering were on site observations, directed
interviews and protocol analysis of past case files. Two to three working days were spent in
each organisation premises.

The work analysis was carried out in three main stages. At the first stage an analysis
of real tasks for each organisation (both formal and informal) was performed. Adopting a top-
down approach main goals and the corresponding tasks were considered. These tasks were
then broken down to exhaustively describe the way of their execution. This exhaustive
description aimed at identifying all probable eventualities and corresponding actions. This
was made possible by a thorough study of a large amount of exchanged messages during field
observations.

The second stage was the confrontation of the results of the analyses carried out at the
11 organisations. The confrontation resulted in the determination of 11 major common tasks
performed by the majority of the user group. For each task a number of elementary actions
was identified as “likely to occur” during its execution (taking into account all probable
cases). Sixty two elementary actions were identified. Each task comprises a set of actions and
each action may belong to more than one task.

In a third stage the analysis of the information flow between the different agent and
for each elementary action was performed. For this analysis the content of present day
messages exchanged (fax, telex etc.) was considered. These messages are variable and it was
difficult to identify repeated stable patterns of information. However using as framework the
elementary actions identified in the previous stage, stable groups of information linked
directly to specific actions, emerged.

3. Results

The analysis performed resulted in a functional model of the medical assistance work. Using
this model the functions of a telematic application responding to the real needs and
characteristics of the actual work, can be specified.

The model does not consider “a normal course of a case”. It rather tries to describe the
maximum of possible courses of a case. The model is consisted of:
• a General Action model composed by elementary action items,
• a General Data model composed by information groups called Units of Information and
related to the action items.

Action items form elementary processes specific to medical assistance that combined
in groups can represent the process of management of any (or almost any) medical assistance
case. Examples of action items are: “arrange meeting of patient with medical escort” and
“request for estimated cost of medical treatment”. Action items can describe a large number
of possible scenarios without sacrificing the structural integrity of the work performed by the
different agents as well as of their co-operation.

Units of Information are action related groups of information which are always (or
almost always) provided or requested concurrently. For example, the name, medical
speciality, telephone and fax of treating physician, constitutes a unit of information called
“treatign doctor’s personal details”.
The functional model of the medical assistance work presents high cardinality (it contains more than 60 Action items and more than 100 Units of Information) and thus enables maximum flexibility of the future procedures for supporting marginal cases. The Action items and the Units of Information can therefore constitute the basis of the telematic system to be developed. Moreover, given the cardinality of the model, the telematic system has to be supported by an intelligent human-computer interface. In fact, in order to generate a standardised message, an agent (operator or doctor) would have to “navigate” through a thesaurus of Action items and to choose the appropriate Action (or group of Actions) and the related Units of Information. In this way, a very large number of “virtual information forms” could be produced in a matter of seconds without the disadvantages of work with papers.

It is important to note however, that the above concept of the system is independent of a telematics mean of communication, since it can also operate locally with the use of any personal computer and produce printed outputs that could be transmitted via fax. This is an interesting feature not only for the flexibility and robustness it provides, but also because it can produce standard fast forms to be sent to non linked agents, like ambulance companies or local health-care structures.

4. Conclusions
The present case-study shows that the performed work analysis, permitted the identification of user needs and the functional specification of a telematics system in a complex multi-user domain, such as medical assistance. Although at the beginning of the project the computer specialists were not convinced of the need for a thorough work analysis at the front-end stages of the development effort, they found the results of our approach very valuable and time saving regarding the overall design process. In fact, the functional specifications can very easily be transformed to a formal informatics model (technical specifications and prototype development). Furthermore, given that the results of the analysis proved to be very comprehensive to and well accepted by the future users of the system, the evaluation and validation of the prototype is expected to be significantly facilitated.

References

The present project was supported by the European Commission, DGXIII in the frame of the COPERNICUS Programme under contract N.B. COP1208.