Need for Action Oriented Design and Evaluation of Information Systems

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Abstract
The problem we are approaching is that the actions offered by computerized information systems (IS) often seem to disharmonize with the actions performed in work practice. In this paper, we have analysed a representative usability-oriented checklist supporting design and evaluation of computer-based systems. The analysis has been made from an action perspective. One result is that the checklist is more oriented towards cognitive aspects. Action oriented improvements are suggested.

1 Introduction

The problem we are approaching is that the actions offered by computerized information systems (IS) often seem to disharmonise with the actions performed in work practice. Several researchers report faults in IS use. For example, Henderson & Kyng (1994) claim that there is a discrepancy between the design of IS and the work situation. Bannon (1994) claims that there is need for a better understanding among researchers and system designers about users and their work settings. We need to understand people as actors with a set of skills and shared practices based on work experience (ibid.)

There are many different philosophies, methodologies or checklists (such as object-oriented, traditional, participatory design, prototyping) aiming at supporting IS development or evaluation. In the Human Computer Interaction area the concept of usability and IS are focused. In this area we can find checklists such as Nielsen's (1994) ten usability heuristics, design principles such as Shneiderman's (1998) eight golden rules and usability models presented by Shackel (1984). What they all seem to miss or at least not have in focus is the action character of the IS.

In this paper, we adopt an action perspective on information systems (see section 2). The action perspective emphasises what users do while communicating through an IS. In Cronholm & Goldkuhl (2002) several actable quality ideals have been suggested. These quality ideals are derived from action theory (Mead, 1938; Goldkuhl, 2001) and empirical findings. The aim of the quality ideals is to support design and evaluation of IS. The aim of this paper is to show that the action character is not focused on in a representative checklist developed from a usability perspective. We have chosen Nielsen's (1994) ten usability heuristics since they are well known and frequently used. Finally, we will suggest some complementary quality ideals.

2 An Action Perspective on Information Systems

We adopt an action perspective on information systems. Actions are humans´ intentional way of changing the world. Humans intervene in the external world. These intervening actions are overt actions, which can be communicative or material. Actions can also be covert. In such a situation a human tries to make sense of something external. He performs an interpretative action. He is not

changing something externally as in intervening actions. He is instead trying to change his inner world, his knowledge of the external world. Besides interpretative actions, there are other covert actions. When a human is intentionally trying to solve a problem mentally through reflection this can be seen as a covert action. This action view is inspired by American pragmatism (e.g. Mead, 1938), social phenomenology (e.g Schutz, 1962) and language action theories (e.g. Austin, 1962). See also Goldkuhl (2001) and Goldkuhl & Ågerfalk (2000).

From an action-oriented perspective, IS are viewed as communication systems, as distinct from strict representational views of information. A representational view of information means that designers try to create an 'image' of the reality in order to have the analysed piece of reality properly represented in the systems database. This strict representational view can be challenged, which an action perspective certainly does (e.g. Goldkuhl & Lyytinen, 1982). In the action-oriented perspective, IS are not considered as "containers of facts" or "instruments for information transmission" (Goldkuhl & Ågerfalk, 2000). The action-oriented perspective emphasises what users do while communicating through an IS (*ibid.*). IS are systems for action in work practices, and such actions are the means by which work practice relations are created.

IS have action ability. We call this IS actability. We define actability as an IS ability to perform actions and to permit, promote and facilitate users to perform their actions both through the system and based on messages from the system, in some work practice context (ibid.). Within the actability perspective the notion of IS can be defined in the following way: An IS consists of

- action potential (a predefined and regulated repertoire of actions)
- actions performed interactively by the user and the system and/or automatically by the system.
- action memory (a memory of earlier actions and including other prerequisites for action)
- documents (as action conditions, action media, action results)
- a contained structured work practice language (giving frames for actions, action memory and documents)

Designing an IS means suggesting and establishing an action potential. An action potential both enables and delimits actions. It entails a repertoire of actions and a related vocabulary. The vocabulary consists of concepts related to the work practice language. An IS must also offer a record of actions performed. Information about these performed actions can normally be found in the IS database. We call it an action memory, which is part of an organizational memory.

3 Analysis Model and Categorization

In order to analyse the action character of the usability heuristics we have used the elementary interaction loop model (Cronholm & Goldkuhl, 2002). The model is inspired by Mead's (1938) stages of an act. The reason for using this model is that it in a generic sense describes the interaction between a user and a computerised IS. The interaction is divided into four phases within the loop: informing, execution, IS action and interpretation (see figure 1).

In the informing phase the user has to be informed from the screen document about what can be done. He/she must have knowledge about which possible actions can be carried out. After being informed, the user executes an action (for example by clicking on a button on the screen document). The IS reacts by performing its corresponding IS action. When the IS action is performed the user interprets what the IS has done.

The screen document plays important roles in the interaction. One can say that the screen document is multifunctional. It contains *information about the action possibilities*. In this sense it is used in the informing phase when the user is reading the screen figuring out what to do.

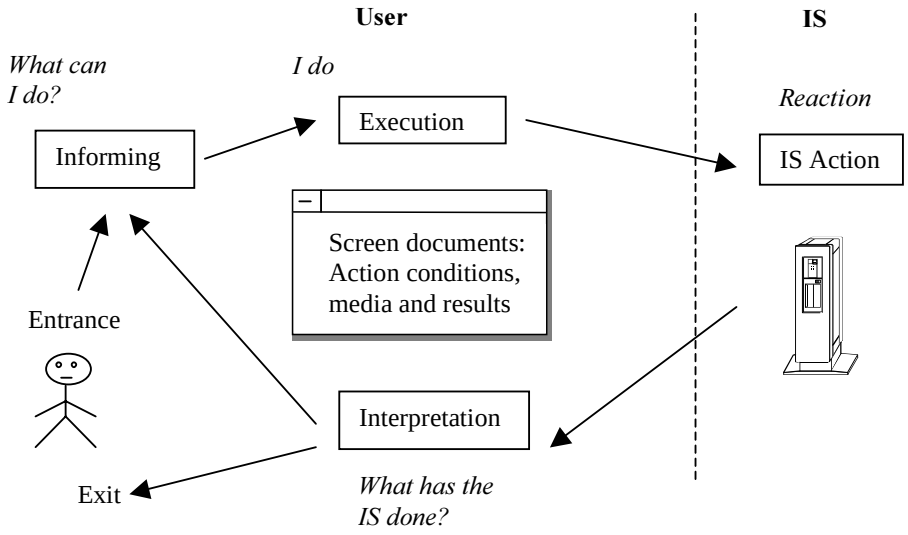

Figure 1. The elementary interaction loop (EIAL), (Cronholm, Goldkuhl, 2002)

The screen document also functions as an *action media* in the execution phase when the user performs an action (for example clicking on a button). The user can also (in the execution phase) type some information in a field and the screen document consists in this sense of *action results* of the user execution action. The IS action can result in changes of the screen document (as a feed-back to the user). This means that it contains *results of the IS action*.

In order to analyse the action character of the Nielsen´s ten heuristics we have categorized the heuristics according to the model phases informing, execution, IS action and interpretation (see table 1).

Table 1. Categorization of the usability heuristics

Usability Heuristics (Nielsen, 1994)	**Categori-zation**
Visibility of system status. The system should always keep users informed about what is going on, through appropriate feedback within a reasonable time.	Informing IS action Interpretation
Match between system and the real world. The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.	Informing IS action Interpretation
User control and freedom. Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue. Support, undo and redo.	Informing Execution
Consistency and standards. Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.	Informing

Usability Heuristics (Nielsen, 1994)	**Categori-zation**
Error prevention. Even better than good error messages is a careful design which prevents a problem from occurring in the first place.	Informing Execution
Recognition rather than recall. Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.	Informing
Flexibility and efficiency of use. Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.	Execution
Aesthetic and minimalist design. Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.	Informing
Help users recognize, diagnose, and recover from errors. Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.	IS action Interpretation
Help and documentation. Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out.	Informing

4 Conclusion

It is clear that some of Nielsen's heuristics have an action character such as the informing-related heuristics "recognition rather than recall" and "visibility of the systems status". However, most of the heuristics are more oriented towards cognitive aspects. When comparing the analysis results with Shackel's (1984) classical model consisting of the related components user, tool, task and environment it is clear that the heuristics are more user- and tool-oriented. From an action perspective, IS are viewed as communication systems. The action perspective emphasises the actors (communicators, receivers) and the actions (what the actors do while communicating through an IS). We claim that the heuristics should also include action oriented quality ideals such as "understanding the screen document" and "action memory – easy accessible and personalized". (For a exhaustive description of actable qualitative ideals, see Cronholm & Goldkuhl, 2002.)

"Understanding the screen document" means that the contents of the screen document should offer good conditions for performing actions both within and outside the IS. Information presented must be easily understandable. Relations between IS-supported actions must be visualised in a way that the users easily understand if there is a specific order among the offered actions. "Action memory – easy accessible and personalised means that information stored earlier about previous actions should be easy to access. The action memory can consist of both historical information (actions that have been performed) and expected actions (actions that should be performed). It should also be clear who is responsible for the content of information communicated. Information about "who has said what" should be stored in the IS as part of the action memory. This quality ideal can be seen as an exhortation to avoid anonymity in information systems.

Further, we think that Nielsen's heuristics can to high degree be seen as a checklist for user-interface design. One fault is that the heuristics are presented in a sequential list without any

explicit order and that they are not explicitly or theoretically grounded. In order to analyse the action character, we have categorized the heuristics according to a theoretical model that in a generic sense describes the interaction between a user and a computerised IS.

We claim that if one includes action oriented quality ideals in a design or evaluation situation, one will have a high degree of probability to reach an actable information system. Of course there are other ways to arrive at actable systems. Following other approaches does not exclude the possibility to create an actable system. For example following object-oriented approaches (e.g Kruchten, 1999) or Nielsen´s usability heuristics might well lead to actable systems although those approaches do not contain explicit criteria for actability design. In such cases actable systems are created *by chance*. In the case of using the actability quality ideals, actable information systems are created by *intentional and conscious design*. The main contribution of this paper is to present the elementary interaction loop and argue for that an action perspective can complement established criteria/heuristics developed from a usability perspective.

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