A framework for developing the on-line HCI glossary: Technical Report

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Table of contents

1. Introduction 3

2. Current terminology in HCI research 6
2.1. The origin of HCI as a research discipline 6
2.2. HCI models and research perspectives 6
2.3. Sources of current HCI terminology 8
2.3.1. ISO standards 8
2.3.2. HCI handbooks 10
2.3.3. User interface guidelines and style guides 10
2.3.4. Usability gurus 11
2.3.5. Technical documents 11
2.3.6. De facto standards 12
2.3.7. Internet on-line HCI dictionaries 12
2.4. Knowledge transfer 17
2.5. The impact of HCI terminology on the current HCI status and maturity 18

3. Proposed concept of the HCI glossary: the on-line HCI dictionary 20
3.1. General concept of the HCI glossary 20
3.1.1. General requirements 20
3.1.2. The Structure of the on-line HCI dictionary 21
3.1.2. Contents description 25
3.2. Main functionality of the on-line HCI dictionary 27
3.3. A prototype of on-line HCI dictionary 29
3.3.1. Construction of the prototype on-line HCI dictionary 29
3.3.2. Results of the prototype evaluation 32

4. The on-line HCI dictionary in its "context of use" 35

5. Conclusions 37

References 38

Appendix. The complete glossary 40

1. Introduction

The primary goal of any specialistic terminology is to facilitate communication among experts within a specific domain, as well as with the external world. The existence of established terminology used by specialists within a particular discipline defines the research area as a distinct field of expertise. Moreover, consistent, established terminology is a crucial condition for reaching higher levels of maturity in research, and also it marks the status of the discipline among other sciences.

For many disciplines developing consistent professional terminology was the key point for gaining wide acceptance as established scientific activity. This phenomenon has been observed especially in case of "young" sciences like marketing, management or - the most recently - artificial intelligence, whose status was for many years the matter of question whether they should be treated as separate and distinct areas of scientific activity.

HCI (Human-Computer Interaction), as a "young" science, is still coping with the problem of self-identity and building long-lasting position among other sciences relevant to information technology. Being in a transition phase towards more established status means that HCI community has to answer important questions, crucial for building solid fundaments for future. Experiences from other "young" scientific disciplines, which have successfully solved this problem, encourage having a closer look on the role of professional terminology (glossary, dictionary) in achieving higher maturity in research. The question to what degree HCI has developed an established professional glossary, is a crucial issue for building a solid status for HCI as a research discipline.

Rauterberg (2000) presented a stimulating discussion of the current trends in HCI and necessary conditions for improving its status by transition from *explorative* phase to *paradigmatic* phase. These conditions outline three key action areas:

Developing a theoretical framework describing the discipline' research objects and problem definition - supported by validated, original research methodology;

Developing coherent scientific language, and achieving consensus on the terminology specific for HCI area;

Founding a research line to develop design relevant knowledge in a validated manner with predictive power.

These three areas are interrelated, but progress in improving research methodology and strengthening theoretical foundations cannot be made without prior consensus on a coherent corpus of professional terminology, specific for HCI domain[1]. Development of professional glossary and reaching consensus undergoes following phases:

- identifying key concepts: attempts in developing basic descriptors which identify main objects and relationships within research domain;
- refinement: establishing a set of key definitions, which are recommended and documented as a formal glossary in handbooks, standards and other references;
- consensus: the glossary gets wide acceptance within research community and is shared by all professionals involved in the specific area.

[1] Including also User-System Interaction (USI) area, which claims to cover broader spectrum of research issues, including also HCI. Nevertheless, in further parts of this paper the term HCI will be used but topics discussed cover in the same degree HCI and USI areas.

Since the birth of HCI as a research discipline, existence of special terminology, its coherence and consistent use have always been the problematic issues. Currently HCI seems to be at the end of identifying key terms, starting the refinement stage.

Lack of established, coherent terminology has been for a long time a serious obstacle in reaching maturity level and in improving the status of HCI as a research discipline; the glossary is not only a formal representation of a professional terminology but primarily it is the hallmark of maturity in this particular domain. Moreover, using a particular terminology and referring to the established glossary by HCI professionals identifies their "research affiliation" and helps to build up the integrity of professional community.

This report is aimed to present a concept of the prototype on-line HCI dictionary, which would be helpful in achieving higher maturity level of HCI research and in improving communication among HCI professionals.

The proposed HCI glossary will offer the following core functionality:
- it will contain recommended definitions of HCI terminology,
- it will be available on-line as a WWW site,
- it will serve as a credible reference for clarifying HCI terminology,
- at least in the initial stage the glossary should be based on commonly accepted terms, basing primarily on terminology declared in international standards and established scientific literature.

The proposed on-line HCI dictionary is believed to improve consistency of HCI terminology as well as to offer a coherent corpus of descriptors to be used in research and design. The final representation and use of HCI glossary depends both on its contents and form:
- its contents should be validated by competent editor(s),
- the glossary (dictionary) should be easily accessible by internet,
- the glossary should be integrated with resources on HCI research methodology.

Encouraging the use of HCI glossary and finally reaching consensus phase about HCI terminology depends on several factors:
- gaining a wide acceptance for the glossary as a useful tool and a leading reference,
- excellent accessibility, usability and credibility,
- long-lasting motivation of users – not only for individual sake, but also for benefits of the whole HCI community.

The proposed on-line HCI dictionary will be addressed to following user groups in the areas:
- research: HCI researchers in academia and in industry;
- design and development: software developers, designers of user interfaces and project managers,
- teaching: students and authors.

The key factor for achieving the wide acceptability of on-line HCI dictionary is its actual usability for individuals and for the whole community. Following requirements must be met:
- the glossary must serve as a resource for design, research and representation of concepts that are already in use and those relevant to future developments;
- it must interact with HCI domain surrounding and its specific "context of use";
- everyday use of the glossary must be encouraging, that means users can find there useful and relevant contents, so they would be willing to recommend this glossary to others.

If acceptability and usability expectations would be not fulfilled, a risk exists that a "dead" dictionary will be created, which will not find a vivid response in HCI community. The issue of social acceptance is therefore crucial for implementing this idea and for promoting the use of dictionary for the benefits of the HCI community.

Further parts of this report present:
- the overview of sources for current terminology in HCI (Chapter 2),
- the overall concept and evaluation results of prototype on-line HCI dictionary (Chapter 3),
- the discussion on expected "context of use" (Chapter 4),
- conclusions for further developments of presented concept (Chapter 5).

2. Current terminology in HCI research

2.1. The origin of HCI as a research discipline

HCI as a scientific discipline arose as a field from intertwined roots in computer graphics, operating systems, human factors, ergonomics, industrial engineering, cognitive psychology and the systems part of computer science (ACM-SIGCHI, 1997). Computer graphics and the use of pointing devices led to the development of essential human-computer interaction techniques. Work in computer graphics has continued to develop algorithms and hardware that allow the display and manipulation of ever more realistic-looking objects, leading to really interactive data processing with graphical user interface.

Computers and software applications supporting human mental work often have been perceived as an "augmentation of human intellect", but more appropriately they should be described as artefacts supporting human cognitive tasks. Because quality of input/output and the design of user interface dialogue has a big impact on amount of committed errors and on acceptance of the software tools by end users, the quality of interaction, software usability, and their impact on task performance have become a natural interest for early HCI research. Human interaction with computers has gradually become also an intriguing research topics for ergonomics, therefore a cognitive extension to a traditional field was necessary, resulting in the current "cognitive ergonomics". Because of their roots, ergonomics studies of computers emphasise the relationship to the work settings, task design, organisational conditions and also the effect of work environment (lighting, vision etc.) on user performance. Because local factors shape user performance in computer-supported work much stronger that in traditional industrial workplaces, this observation resulted in developing the term "context of use", which describes all conditions of local work environment, including also user characteristics.

Finally, the growth of discretionary computing and interactive task execution has led to the today's stronger dependence of work outcome on quality of user interfaces than it was in the past. As a result, the gradual evolution of a standardised interface led to flexible and individually configurable "interaction space". Along with these changes, researchers and designers have begun to develop specification techniques and testing techniques for practical production of better user interfaces. Because the object of study involves human, organisational and technical issues, HCI in a natural way has become interdisciplinary character, reflected also in diverse professional background of developers and researchers, working in HCI area.

2.2. HCI models and research perspectives

For many years the joint performance of tasks carried out together by humans and computers has been the central focus of HCI research interests; therefore optimising interaction between human and computer towards higher productivity was an natural consequence of this interest. However, up to now only few quantitative formulas have been developed, which have been well grounded in physiology or psychology, and which sufficiently proved their applicability for designing interaction elements for computer-supported tasks. Moreover, most HCI models and solutions remain context-dependent, and they generally represent rather weak predictive power.

Applicability of these models to specific, narrow domains does not help to solve practical problems appearing during systems development; design practice requires more universal solutions, not limited to a specific aspect of interaction or a system type. The basic difficulty with current models is that if such a narrow-domain model or model-based solution is to be transferred to another domain or system type, it usually requires experimental validation in new conditions, what takes time and labour to calibrate the model accordingly.

It should be also noted that currently available solutions, offered by HCI research, generally represent visible split between two dominant groups: general guidelines and detailed recommendations. Both groups are helpful in developing a better user interface, but at very different levels. General guidelines are useful as high-level principles guiding user-centred design activities and evaluation. In turn, detailed recommendations are helpful in designing elements of dialogue, developing blocks of interaction and finally preparing detailed checklists for dialogue evaluation.

Anyway, this is a different type of outcome than expected by engineering community involved in systems development. This community of professionals would like to receive from HCI research a set of strict, quantitative or rule-based solutions – an outcome that is not yet deliverable and which is not bound to come, as long as models of human performance are so much imperfect.

Nowadays, when most of standardised dialogue components (like menus, dialog boxes, buttons, icons etc.) have been implemented in programming environment, most of designers need primarily a support in solving conceptual problems, related to interaction design. A typical problem of this sort is designing or selecting the best variant of dialog structure, in which standard components may be placed in many possible ways. In such cases high-level HCI guidelines are too general to help, and detailed requirements in turn do not include specific context of use, what may guide to sub-optimal solutions. Selecting of the right model-based design rationale is problematic (Moral and Carroll 1996, Doorst 1997), because many HCI models are available, and almost each one is restricted to a specific narrow domain. This situation leads to a large number of fragmentary solutions and different approaches – a fact, which is much discouraging for practitioners looking for practical solutions.

The issue of different research perspectives within HCI domain and the lack of generic description of system dynamics (regarding the system user-computer-environment), have been often raised (Green et al. 1996, Monka and Gilbert 1995, Carroll 2000) as evident weaknesses of current HCI research. On the other hand, this problem has not been much better solved in other application areas where human factor is involved, like for instance in industrial process control; industrial workplaces are a subject of much stricter legal and hygienic regulations, therefore they apparently should be easier to formal analysis, evaluation and design.

Despite of unquestionable progress in knowledge about the nature of human-computer interaction, predictive power of HCI models remains still lower that expected. In opposition to strict sciences, which have developed a solid measurement techniques and computational methods based on validated models, HCI as a research discipline still struggles with this problem. A bit eclectic nature of HCI instrumentation does not help in shaping coherent streamline of HCI research, as well as in proposing generic solutions, which would be firmly grounded in experimental psychology or human factors research, and applicable in most of practical cases.

As a result of presented background, HCI today still represents a crossroad of:
- experimental psychology, as to:
  - applied measurement techniques,
  - developing performance standards dependent of specific populations of users;
- engineering sciences, as to:
  - planning efforts aimed for building a better user interface, based on human factors data and systematic design approach,
  - developing more usable systems, bringing high performance to the users;
- social sciences, as to:
  - in studying relationship between the human and its social/organisational environment,
  - searching for components shaping creating human performance in a way closer to management science, by identifying factors having positive or negative effect and those critical for the performance of a work system,
  - using analytic techniques borrowed from marketing and consumer research in order to bring high satisfaction to the users by developing more usable systems.

This diversity of available research HCI perspectives leads to following observations:
- lack of unified approach and lack of the main streamline of HCI research is partly caused by a very dynamic technological and organisational environment where the study takes place,
- the knowledge about user behaviour is still incomplete, while all elements of the user interface (or generally speaking, of "the computer") can be almost fully controlled by system designers - although their impact on work system performance is only partially predictable,
- measuring quality of interaction is still a challenge due to subjectivity of evaluation and different preferences of the users.

Complexity of problems discussed above has a direct impact on the future directions of HCI research and also on the current state of HCI terminology.

2.3. Sources of current HCI terminology

Existing diversity of research approaches is one of the reasons for weaknesses observed in HCI taxonomy; applied terminology depends in a high degree whether a specific research is basically grounded in psychological, social or engineering sciences.

Several attempts have been already made to gather HCI-related terminology in documented forms, usually for the purpose of different projects, communities and research groups. This section presents a short overview of currently available sources, in which HCI terms and definitions can be found.

2.3.1. ISO standards

Documented ISO standards represent approved documents, which in principle should serve as a primary reference in terminological questions relevant to HCI. Most of ISO standards, as well as national standards, have a section entitled "Definitions" and it regards also standards relevant to HCI. The most important HCI-related ISO standards are:
- ISO 9126 "Software Quality Characteristics" (ISO 9126);

- ISO 6835: 1981 “Ergonomic principles in the design of work system”;
- ISO 9000, 9001, 9002 “Quality process management and quality assurance standards”;
- ISO 9000-3: 1991. “Quality Management and Quality Assurance Standards. Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software”;
- ISO 9126-1 “Software Quality Characteristics”: to replace ISO 9126,
- ISO 9421, parts 10-17 “Ergonomic requirements for office work with visual display terminals (VDTs)”;
- ISO 10075-1 “Ergonomic principles related to mental workload – General terms and definitions”;
- ISO 11064 “Ergonomic design of control centres”;
- ISO 11581 “Usage and appropriateness of icons”;
- ISO 13407 “Human-centred design processes for interactive systems”;
- ISO 14598:1991 “Information technology - Software lifecycle processes”;
- ISO 14915 “Software ergonomics for multimedia user interfaces”;
- ISO 18019 “Design and preparation of user documentation”;
- ISO 18789 “Ergonomic requirements and measurement techniques for electronic visual displays”;
- ISO 20282 “Usability of everyday products”.

There are many other ISO standards (and also ISO technical reports and working drafts in preparation), which include HCI terminology. An extensive inventory of ISO HCI standards is available at a WWW site: *http://www.usability.serco.com/trump/resources/standards.html*.

Definitions proposed by ISO standards generally suffer from two general problems: ISO terminology has not been yet fully applied in practice, and ISO terminology also contains some inconsistencies - often in essential definitions.

For instance the definition of “user” can be found in two slightly different versions in two parts of the same standard:
- ISO 9241-10: user – “an individual interacting with the system”,
- ISO 9241-11: user – “the person who interacts with the product”.

If an interested reader wants to check what is the difference between the “product” and the „system”, s/he will also find at least two definitions for the „product”:
- ISO 9241-17: product – “the part of the equipment (hardware, software and materials) for which usability is to be specified or evaluated”,
- ISO 12207:1995, ISO 9126-1: software product - “the set of computer programs, procedures, and possibly associated documentation and data”.

The same happens when an interested reader is looking for the definition of “system”:
- ISO 9241-13 – system: “a combination of the hardware and software elements that the user interacts with in carrying out the user’s tasks”,
- ISO 12207:1995, ISO 9126-1: system – “an integrated composite that consists of one or more of the processes, hardware, software, facilities and people, that provides capability to satisfy a stated need or objective”.

Subsequently, if an interested reader tries to find the meaning of the crucial term “interaction”, the search will be fruitless, because “interaction” has not been defined in ISO standards. Only the “interactive system” is defined in the following way:
- ISO 13407: interactive system - “a combination of hardware and software components that receive input from and communicate output to a human user in order to support his or her performance of a task”.

As shown in the presented example, quality of terminology in ISO standards is still far from excellent but undoubtedly a lot of important terms have been already introduced. It should be noted that among other sources of terminology only ISO standards have the potential to play a regulatory role, because terminology from ISO standards is obligatory and has been approved. Due to higher expectations, any inconsistencies and contradictions found in ISO terminology not only frustrate the reader (especially if s/he is out of HCI domain), but they also diminish the credibility of HCI-related ISO documents.

2.3.2. HCI handbooks

Special HCI handbooks, written primarily for the academic audience, should be in principle a reliable source of up-to-date terminology, especially for the readers who are HCI professionals. HCI handbooks might be also a good source to verify sometimes inconsistent terms found in ISO standards - taking into account the fact, that the definitions from HCI handbooks are not binding, and those from ISO standards are.

Up to now only few books on software engineering (like Evans and Marciniak 1987) or on usability and HCI (like Urbanek 1991) contain an appendix or a special section called "Glossary", where terminology proposed by the author(s) is presented. Unfortunately, quite often proposed definitions are different than definitions already known from other sources - books by other authors or ISO standards, but are rarely the reference to original definitions are given. Although the principal intention of the authors is to clarify terms used in the handbooks, lack of reference to earlier definitions may cause misunderstandings and inconsistency. This may especially happen if a reader has to quote some important fragment, which contains a questionable definition, and the source does not offer a formal definition from the glossary. In contradiction to officially approved ISO definitions, terminology proposed in HCI handbooks can be always treated as a postulate, eventual inconsistencies are less critical and are of author's responsibility only.

2.3.3. User interface guidelines and style guides

User interface guidelines, addressed to interaction designers, usually contain an appendix "Glossary", which gathers definitions used in the body text. Two principal guidelines are now in use, addressed mainly to interaction designers:

- by Apple Computer – "The Macintosh Human Interface Guideline" (Apple Computer 1998) is the style guide for Macintosh user interface;
- by Microsoft Corporation – a style guide "Microsoft Windows User Experience" (Microsoft, 1995), updated for subsequent versions of MS Windows.

Glossaries attached to both style guides contain a large number of terms concerning all elements of user interface characteristic for either environment, and it is thus not very surprising that the content of both glossaries differs a lot. The same terms in both glossaries differ in contents and style, but there are no dramatic contradictions at least in key terms. Some differences can appear as natural, because they stem from specific solutions developed by both software companies, and many definitions can be classified as de facto standards (see subsection 2.3.6. below).

Both glossaries are available as appendices for the paper edition of both style guides and additionally they have electronic versions accessible in the internet, what makes them more convenient to use for infrequent readers (see subsection 2.3.7. below).

2.3.4. Usability gurus

Some famous authors (commonly known as "usability gurus") in their popular books on usability sometimes tend to modify existing terminology. This situation appears usually in two cases:

a) an author introduces a new term, like "affordance" introduced by Spool et al. (1999), as a natural attempt to propose a new definition needed for a novel object or phenomenon,
b) an author uses a term known from ISO terminology or other books in a meaning different from the original one, what may bring confusion to the reader and be misleading.

Additionally, different gurus sometimes use the same term in different meanings, or call the same object in different ways. As the gurus in HCI community are very influential and they play a very specific role, some supplementary observations can be made:

- usability gurus very seldom refer to definitions from ISO standards, more often they refer to definitions from other handbooks or papers,
- usability gurus usually introduce novel terms directly in the body text, instead of presenting them in a separate, explanatory section "Definitions" or "Glossary", like in typical engineering handbooks.

A good example from this field was given by Rauterberg (2000), who recalled that the concept of "interaction style", early introduced by Shneiderman (1987), was translated into "dialogue style" by Mayhew (1992) and next into "dialogue technique" by Cakir and Dzida (1997), referring to ISO 9241. Neither term „interaction style" nor "dialogue style" can be found in the keyword index of Fox (1990) or in the fundamental work of Helander, Landauer and Prabhu (1997). Rauterberg (2000) recalled also the case of de Vet and de Ruyter (1996), who introduced a "concept of interaction styles", that decomposes an interaction style into three components: conceptual operations, interaction structure and interaction techniques. These authors gave there the definition "an *interaction style* is thus defined as the execution of a conceptual operation within an interaction structure using an interaction technique" – a definition which was not formally formulated by Shneiderman (1987).

These two examples clearly show the need of developing the consistent taxonomy of human-computer interaction - the need raised originally by Baecker and Buxton (1987) and recently supported by Rauterberg (2000).

2.3.5. Technical documents

Various technical documentation (like system specification, project management plan, user manual) used during project realisation often contains a glossary of terms relevant to specific system or its application domain. This type glossary is basically aimed to facilitate communication between developers, managers and the institutional client for whom the interactive system is developed.

If each term in a glossary refers to known definitions or presents meaning agreed by all partners in the project, such a glossary may be a very helpful tool. The doubts and risks arise if the project glossary presents for a known term a definition different than given in ISO standard or in an established literature; again, such situation may bring confusion and be misleading for project stakeholders.

2.3.6. De facto standards

In recent years some innovative design solutions (not necessarily grounded by HCI theory) have been found very successful and therefore widely applied in user interface design – often sooner that an unique name for this solution has been proposed and agreed. The successful solution – if it was not patented – has been copied by other developers and gets known under a specific name.

Such a case was observed for instance in a commercial product Lotus Organizer, which first introduced pop-down descriptors called "balloon help" (Fig. 1.). This successful innovation was soon copied by developers of other applications, and got widely known in MS Windows applications as "help flags" (Fig. 2.). Similar situation could be observed with other popular interaction elements, like scroll bars, radio buttons etc., and most recently with "hover" (left-panel scrollable control bar) successfully applied first in Microsoft Outlook and later widely followed in other applications.

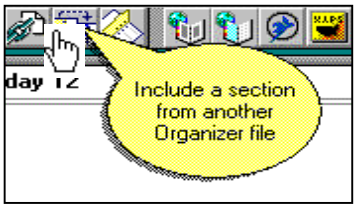

Fig. 1. "Balloon help" in Lotus Organiser.

Fig. 2. "Help flag" in Netscape Navigator.

The term "de facto standard" therefore describes a successful solution, with received wide acceptance in practical use and gets followed by leading software developers – initially with no specific documentation. Subsequently, as a specific solution gets popular in further applications, its formal definition gets gradually adopted to everyday life - and sometimes to glossary sections in guidelines or user interface style guides.

2.3.7. Internet on-line HCI dictionaries

In the internet several interesting on-line HCI glossaries are available, sometimes even created by HCI fans or by students. Much more often, commercial software developers create such on-line glossaries. The purpose of providing public on-line access to such a HCI glossary is usually promotional, but to some degree it can also have a regulatory motivation, depending of the glossary originator and ownership.

On-line glossaries available in the internet differ a lot in contents, form and intended users. They differ in contents and they bear different names, like "usability dictionary",

"HCI glossary" or "HCI dictionary". Following HCI dictionaries, developed and maintained mainly by corporate institutions, are the most interesting and seem to be worth attention:

"Usability glossary" by Usability First

The "Usability Glossary" (Fig. 3.) contains about 900 terms from HCI domain, usability and human factors, including also some professional jargon expressions, up-to-date definitions and even acronyms. The glossary has been created by the company Usability First, a subsidiary of Diamond Bullet, a software developer known for their mission (and results) in promoting usability. Search support for the users includes alphabetical index, directory by categories and search window; users also can submit a term whose definition is required, but not yet available. The target audience of this glossary is presumably the community of HCI professionals from industry first of all, next academia, including also HCI students. The set of terms seems to be frequently updated and well integrated with other sections of Usability First website, which offer various resources on HCI methods, tools and books.

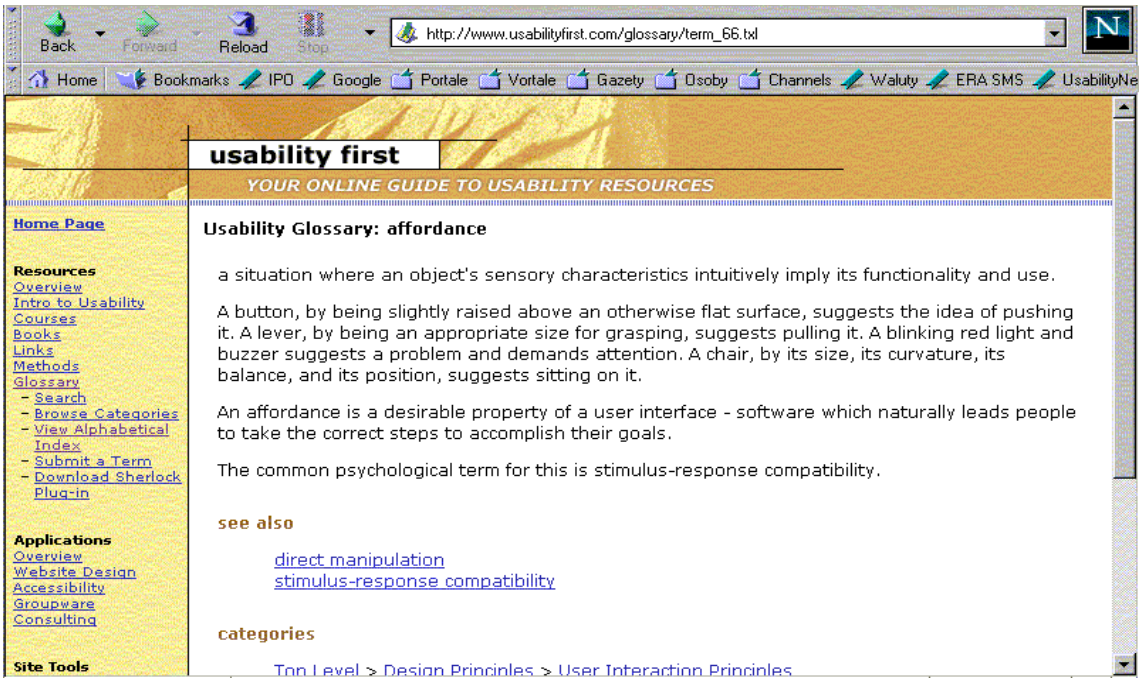

Fig. 3. "Usability Glossary" by Usability First.
http://www.usabilityfirst.com/glossary/index_terms.txl

The HCI glossary by University of Colorado

The glossary (Fig. 4) has been developed by the Center for Lifelong Learning and Design (L3D) at the University of Colorado at Boulder. The glossary presents a broad terminology relevant to cognitive psychology, computer support in learning and user-centred design. Search support for the users include alphabetical sections and a scrollable list of all terms. The glossary seems to be no longer updated and has no links to other parts of the L3D website.

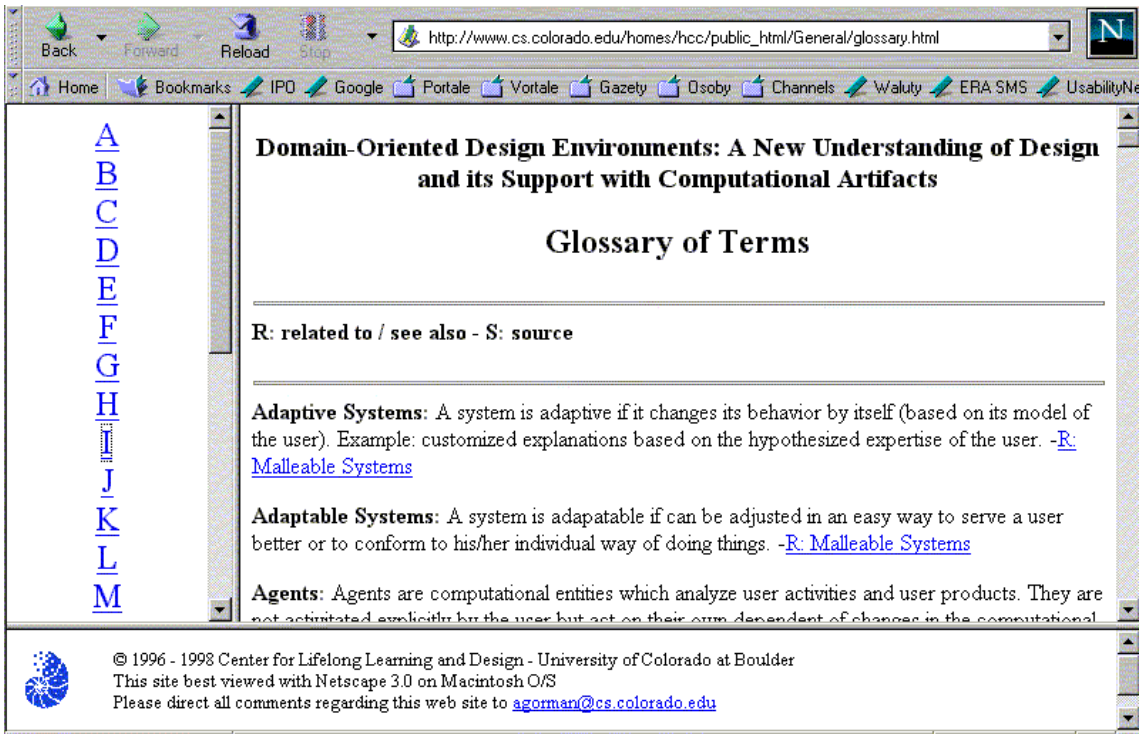

Fig. 4. The HCI glossary by University of Colorado (L3D).
http://www.cs.colorado.edu/homes/hcc/public_html/General/glossary.html

Apple Glossary: "The Macintosh Human Interface Guideline"

Fig. 5. shows the electronic version of already mentioned style guide "The Macintosh Human Interface Guideline" (Apple Computer 1998), where the glossary is a part of this style guide. It is addressed mainly to interaction designers and the electronic format offers direct access to the style guide, although no advanced search mechanism is available except of scrollable list of all available terms. This solution is not very convenient, and the whole glossary has not been updated since the style guide was published – probably for consistency reasons – because the glossary is an integral part of the book.

Microsoft Windows Glossary: "Microsoft Windows User Experience"

Fig. 6. shows the electronic version of "Microsoft Windows User Experience" (Microsoft, 1995), updated for subsequent versions of Windows, also addressed mainly for user interface designers and application developers for MS Windows environment. The collection of terms is really large, and for the user three types of search are available: search window, alphabetical sections and scrollable list of terms (starting from specific character). A section, which contains translation of user interface terminology from English for national languages is indeed very useful for MS Windows application developers worldwide. There is no evidence that the glossary has been recently updated, at least since publishing the last edition of the style guide in 1995.

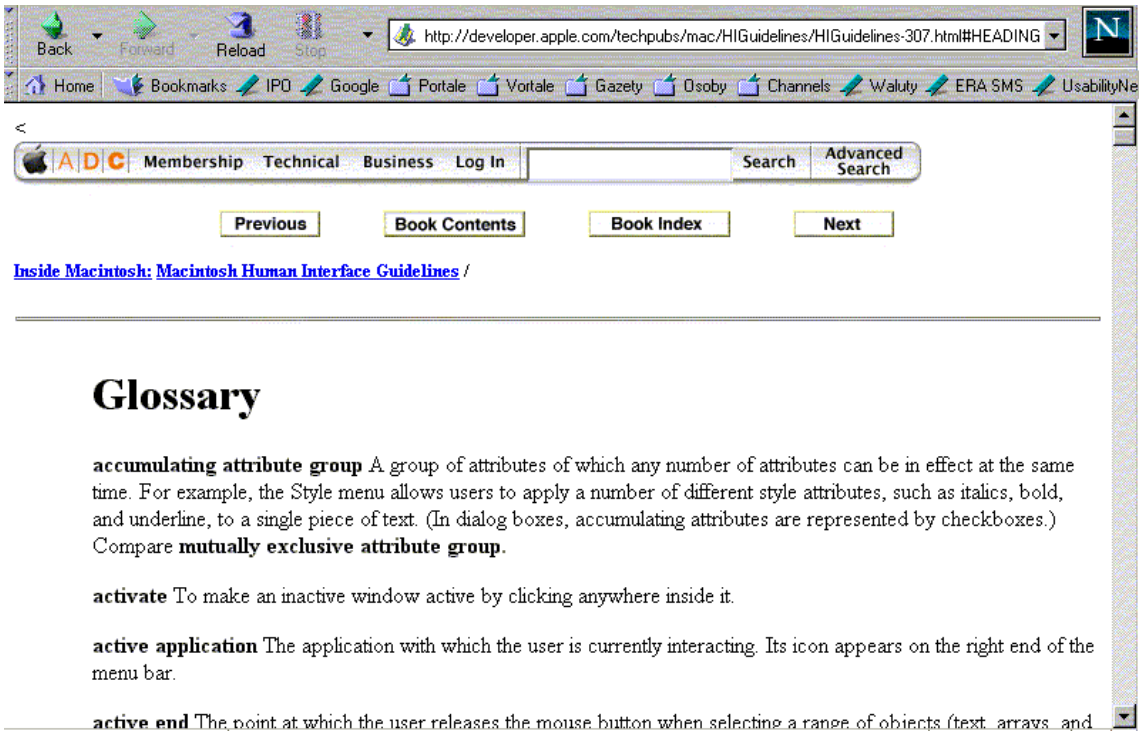

Fig. 5. Macintosh Human Interface Guideline – a glossary.
http://developer.apple.com/techpubs/mac/HIGuidelines/HIGuidelines307.html

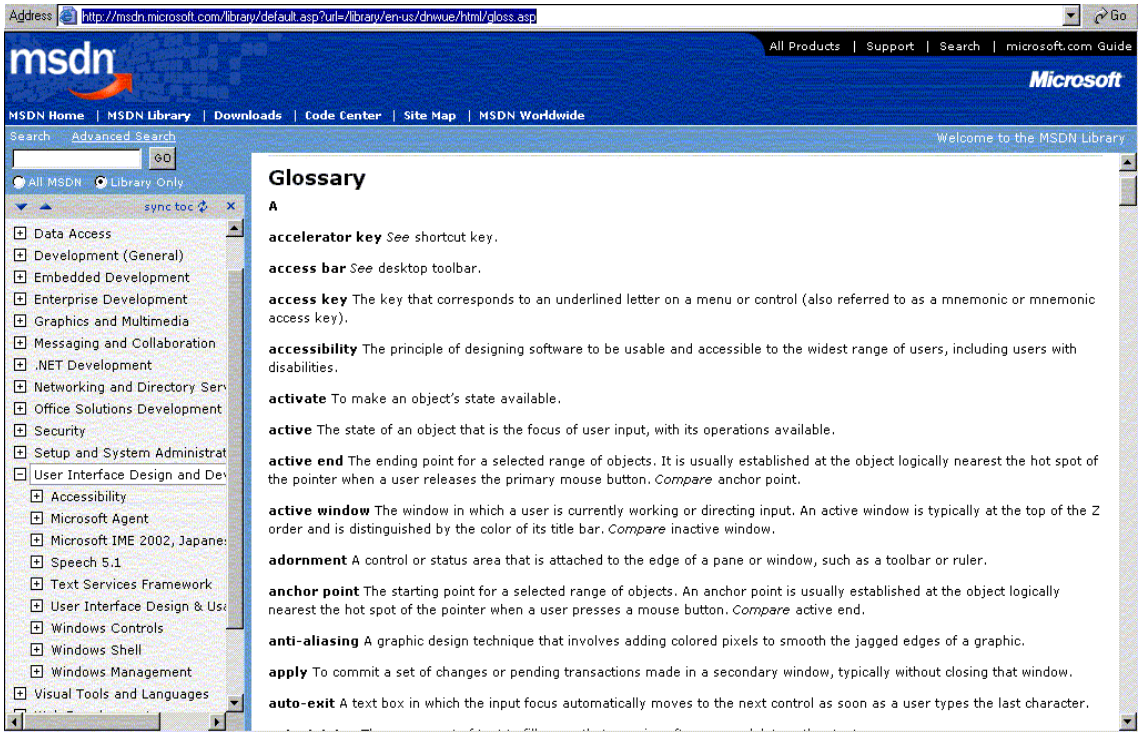

Fig. 6. Microsoft Windows User Experience – a glossary.
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnwue/html/gloss.asp

Interaction Design

The web portal "Interaction Design" (http://www.id-book.com) has been created for professionals and students of HCI and interaction design. The portal has been built upon the book "Interaction Design: Beyond Human-Computer Interaction" by Preece et al. (2001). Apart from the book excerpts it contains a lot of references to various HCI resources on the web, focusing primarily on up-to-date interaction technologies. It contains also a promising section "Glossary", which is however still under development (Fig. 7.).

Fig. 7. Interaction Design portal – a glossary (under development). http://www.id-book.com

In addition to special HCI glossaries listed above there exist also several general-purpose lexicons, like Encyclopaedia Britannica or Yahoo. They contain many HCI-related terms and they can be a valuable reference for many non-specialist users, who look for generic and also semantically correct definitions.

Accessibility to on-line HCI glossaries is much easier than to glossaries printed on paper, in handbooks or in style guides. For this reason the on-line glossaries made available in the internet by commercial companies (Macintosh and Microsoft) play a specific, dual role: as a terminology regulator and as a convenient on-line reference. The "Usability Glossary" of Usability First seems to be the most valuable now, because it is regularly updated, it has multiple search functions, it offers feedback with webmaster/administrator, and it is integrated with other sections presenting HCI methodology and tools.

Generally speaking, on-line dictionaries of the latter type seem to have the most promising future: they are very useful for all groups of target users, they are easy to maintain and they

offer feedback helpful in adding new terms and improving the accessibility of the contents. A reputable on-line glossary has also a potential to play a regulatory role in diminishing inconsistencies, substantially visible in HCI terminology.

2.4. Knowledge transfer

Availability of different sources of HCI terminology affects the way in which knowledge and definitions are transferred between communities involved in research and in industrial activities. This transfer takes place formally and informally in different areas and on different levels: it may concern general concepts, methods, tools, business values, as well as it concerns HCI terminology.

HCI professional glossary can be codified in several ways:
- legally: as a very formal, documented terminology from legal acts, like ISO standards;
- formally: as a set of descriptors found in glossary sections of professional handbooks;
- informally: as a set of descriptors used in research practice and especially in publications presenting methods and results;
- "de facto": using specific descriptors in design documentation, user manuals, help windows etc., therefore forcing users to use terminology suggested by software developers (creating de facto standards by introducing to practice solutions with specific terminology).

The familiarity of HCI standards within engineering community in industry is generally weak, comparing to familiarity of technical standards - lack of recommended values in HCI-related ISO standards, and a lot of general guidelines make these documents difficult to use for a practitioner. Observed inconsistencies, discussed above, do not encourage a non-HCI specialist to conduct further explanatory studies, leaving him/her rather with an impression that the HCI domain is still not mature enough, if it has not yet developed a consistent terminology.

Wide introduction of de facto standards strengthens the power of industrial organisations in introducing new terms mainly through technical documentation and through the applications distributed to customers/users. Sometimes long after gaining users' acceptability, and often after becoming a common component of user-system interaction, the new element gets a deserved place in HCI terminology. Because sometimes the same object appears in different definitions in glossaries published in HCI standards, in HCI literature and in industrial documentation (related to HCI or user interface), these inconsistencies may additionally suggest poor communication within HCI as a research discipline.

There has been often also observed inconsistency between HCI terminology published:
- in *public* documents: ISO standards, guidelines and books by gurus,

and
- in *internal* documents of software projects in industry (technical documentation).

Generally, HCI terminology used in internal documents is more in line with terminology of de facto standards, as they both have origin in industrial developments. As a result, there can be observed the effect "one to many, many to one": the same term may have many meanings in different sources, and the same meaning may be found in different sources under many different names.

Sometimes commonly used terms (like mouse, icon, toolbox) in HCI context get a specific meaning, which systematically gets more popular and more dominant that the original one. This also affects familiarity of HCI terminology, although this transfer is informal but it is very powerful, especially among young users gathered in on-line communities.

In addition to imperfect methods of terminology transfer, terminological inconsistencies affect generic relations between industrial research and academic research, leading often to a sort of competition in the areas:
- who introduces new terms ?
- who shapes the terminology that is in use ?
- who shapes users behaviour by innovative solutions ?

Due to introducing terms related to user manuals, technical documentation and elements of user interface that must be familiar to the users, industrial organisations have much more opportunity to shape HCI terminology than academia can do. This remark is not aimed to demand "more rights" for academia in creating the HCI taxonomy, but it is intended to draw attention to the fact, that this dualism is another source of inconsistency, and also the result of unnatural separating of research taxonomy from the technical terminology. Moreover, for describing interaction problems users use the terms captured from the screen, help windows or user manuals – using also "Glossary" section (if provided) than even the best HCI handbooks. This factor gives the industrial circles a big advantage in creating the popular taxonomy related to HCI - comparing to the relevant potential of research institutions.

The issue knowledge transfer in the context of HCI research methods validation was thoroughly discussed by Rauterberg (2000), who raised the need for developing coherent HCI terminology to facilitate better communication between industry, academia and the users in different application domains.

2.5. The impact of HCI terminology on the current HCI status and maturity

What is current maturity level of HCI as a research discipline? The answer to this key question basically depends on solving the following problem: can the HCI produce reliable solutions, which are based on validated models and on a set of stable variables, which describe the generic system, and which can be manipulated as control variables for keeping the system under control? This question is a generic problem of social sciences methodology, where results are not always reproducible, even if confidence levels are high – and presented models are therefore fragmentary.

The current status of HCI as a research discipline and validity of HCI research has been analysed in the recent paper of Rauterberg (2000), who discussed links of HCI with other research disciplines. He also pointed out the crucial role of (1) validating research methodology and (2) developing coherent HCI terminology as two fundaments essential for improving the status of HCI among other scientific disciplines.

Current status of HCI is caused by the fact that HCI is still the "young" science, which still copes with acceptability problem in industrial circles:
- there is no solid research methodology to be offered to industry, which would be the hallmark of research quality and which would deliver working solutions "at least in 90% cases";

- for different reasons – cultural, communicative and economic - HCI and usability tools are not always accepted as a necessary part of quality management in every software project;
- the status of HCI/usability professionals in companies is very much different, depending on local culture and quality consciousness, however not always appreciated;
- an influential role of usability gurus in HCI research (and in communicating with other relevant disciplines) suggests that other communication channels are not as efficient.

The place and role of HCI deserves between software engineering and systems development is not exactly the result of just research maturity. First of it is the matter of consistency in research methods and consistency of used terminology - even if HCI is still placed somewhere between technology, psychology, management or work ecology. Therefore for improving the status of HCI and its impact on industrial practice **developing coherent HCI terminology** is a starting point; consistent terminology will have also a positive long-term impact on validating research methodology of HCI area.

Because internet is now the primary source of accessing information, this terminology should be available in the form of **on-line HCI glossary/dictionary**, accessible as a typical WWW site. Internet would provide easy access to the glossary for all groups of users: researchers in academia and industry, developers in industry, students or authors. Such a glossary should contain only verified definitions (a coherent corpus of descriptors), so it would be helpful in building up consistent HCI terminology. It could also serve as a regulatory reference, helpful in improving consistency of terms used in HCI publications, making available consistent, recommended terminology based on ISO standards and other sources.

Because such an on-line HCI dictionary would bring many benefits for HCI community and others, developing a prototype is an attempt worth to be undertaken. The next chapter presents the framework of such a dictionary and selected results of prototype testing.

3. Proposed concept of the HCI glossary: the on-line HCI dictionary

3.1. General concept of the HCI glossary

3.1.1. General requirements

This chapter presents a general concept of an interactive HCI dictionary, developed upon considerations presented in the previous section. The term "HCI dictionary" will be used further in order to point out that it is to be a useful artefact available on-line in specific context of use, while the term "glossary" represents primarily an extracted set of definitions.

As mentioned previously, the on-line HCI dictionary is aimed to serve as a reference source for HCI researchers and developers. The presented concept of the dictionary was verified using a small-scale prototype, which uncovered many helpful suggestions for improving its functionality and usability.

The on-line HCI dictionary is intended to present following main features:
- it will work **as a WWW site**:
  - it will be accessible through the internet as a typical public website,
  - it will be maintained by its webmaster (administrator, editor);
- it will offer **credible contents** relevant to needs of HCI researchers:
  - it will serve as a terminological reference,
  - it will contain the most popular terms related to HCI, especially terms often used in publications,
  - it will contain terms found only in documented sources, primarily in standards and quality professional literature,
  - it will contain only verified contents, that means that all terms have been checked up with existing sources and detected inconsistencies have been clarified,
  - if several definitions exists for a given term, the dictionary will suggest the recommended one at the top, and optionally will present remaining definitions for comparison,
  - for each definition its source will be given, easily accessible by hyperlink to an electronic version of the source (if available),
  - feedback form the users will enable updating the contents of the dictionary as well as adding new functionality, expected by the users;
- it will be **regularly maintained** to provide best quality for the users:
  - it will be regularly updated in order to introduce new terms ,
  - it will be regularly reviewed in order to improve available definitions.

The following groups form target users of the on-line HCI dictionary:
- HCI researchers in academia and industry,
- software developers and designers of user interfaces,
- project managers who are responsible for quality and usability of interactive product,
- students of HCI, computer science and other relevant disciplines,
- authors (columnists, writers) of papers and handbooks on HCI, usability and user interfaces design.

HCI researchers in academia are considered as primary users of on-line HCI dictionary, because they are also - in a big part - writers, and they will often recommend the dictionary to their students.

The wide use of on-line HCI dictionary by HCI professionals is aimed to generate a number benefits for HCI community. The dictionary:
- will be serving as a credible reference for verified up-to-date definitions, because it will be presenting only verified definitions and recommended terms,
- will offer easy access to definitions, encouraging frequent use,
- will offer links to definition sources.

Following benefits in the long term are expected:
- it will help in reducing current inconsistencies in HCI terminology and in improving communication
- it will be contributing to improving the status of HCI by introducing more consistent terminology and clarifying the HCI definitions by using more strict language.

Following factors seem to be critical for the success of practical implementation:
- building a working prototype of on-line HCI dictionary,
- encouraging them to frequent use
- gaining lasting acceptance and trust among the users,
- making the dictionary a credible reference source for frequent use and a common element of a HCI toolbox
- providing funding and resources to manage developing the on-line HCI dictionary as a project and later for rewarding labour needed to maintain the dictionary as a living website.

As stated in the introduction (Chapter 1), the issue of gaining social acceptance is therefore crucial for implementing this idea and for promoting its use for the benefits of the HCI community.

3.1.2. The Structure of the on-line HCI dictionary

The contents of the dictionary will basically represent the classical topics of Human-Computer Interaction, accepted according to the model proposed by ACM-SIGCHI (ACM SICGHI, 1998). This model distinguishes following topics:

```
N     The Nature of HCI
      N1    (Meta-) Models of HCI
U     Use and Context of Computers
      U1    Human and Social Organisation and Work
      U2    Application Areas
      U3    Human-Machine Fit and Adaptation
H     Human Characteristics
      H1    Human Information Processing
      H2    Language, Communication, Interaction
      H3    Ergonomics
C     Computer System and Interface Architecture
      C1    Input and Output Devices
      C2    Dialogue Techniques
      C3    Dialogue Genre
      C4    Computer Graphics
      C5    Dialogue Architecture
D     Development Process
      D1    Design Approaches
      D2    Implementation Techniques
      D3    Evaluation Techniques
      D4    Example Systems and Case Studies
P     Project Presentations and Examinations.
```

Fig. 8. presents relationships among key topics from the above list, which consist of four main categories:

- Use and Context,
- Human,
- Computer,
- Development Process.

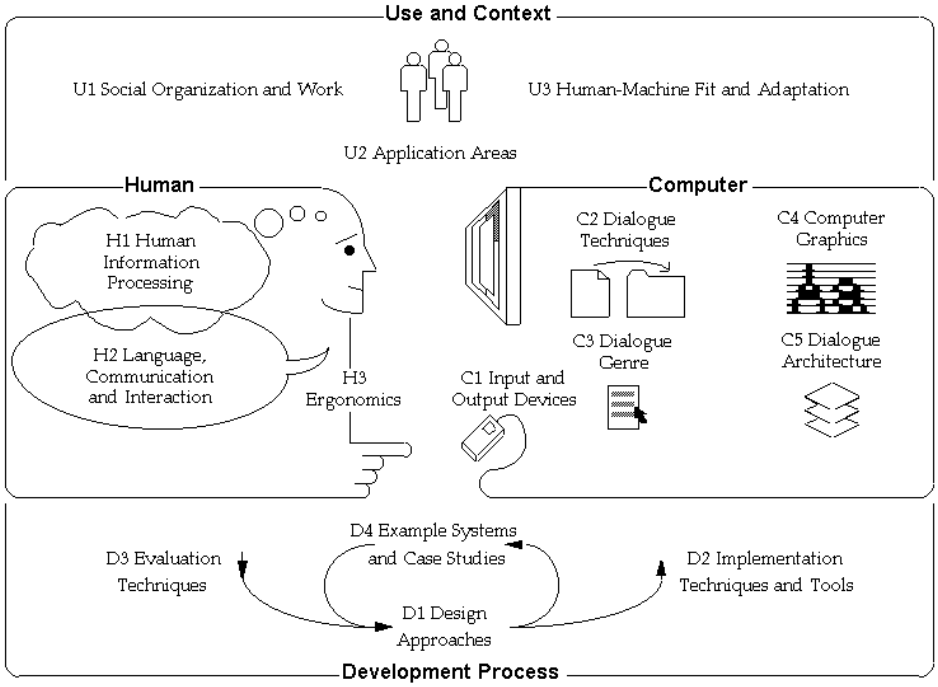

Fig. 8. The main topics of HCI (ACM-SIGCHI 1997).

The model presented in Fig. 8. has been established in the 1990s and it describes main research areas in the early era of desktop computing. At this time computers were placed almost only in workplaces, networking was not essential and use of computers was restricted almost entirely to professional activities.

Because today computers are not used only for work and many everyday products (and even home appliances) have built-in computers so they are fully interactive, the notation *User-System Interaction* (USI) has been proposed by Rauterberg (2000) to point out a broader context in which human-computer interaction takes place. Nowadays, when mobile and ubiquitous computing takes place, USI claims the broadest range of research activities among Man-Machine Interaction (MMI) and Human-Computer Interaction (HCI).

USI therefore is a discipline concerned with the design, evaluation and implementation of interactive systems for human use and the study of major phenomena surrounding them. From such a research perspective an interactive system is defined as a work system {WS} := [{U}, {S}] . Therefore there is a clear distinction between a work system {WS} a work domain {WD} and the relation between them is presented in Fig. 9. A usable system {S} for a work domain {WD} can be only developed taking into account requirements resulting from relationships between the work domain {WD} and a specific work system {WS}, which includes the user {U} and relevant interaction space {IS}.

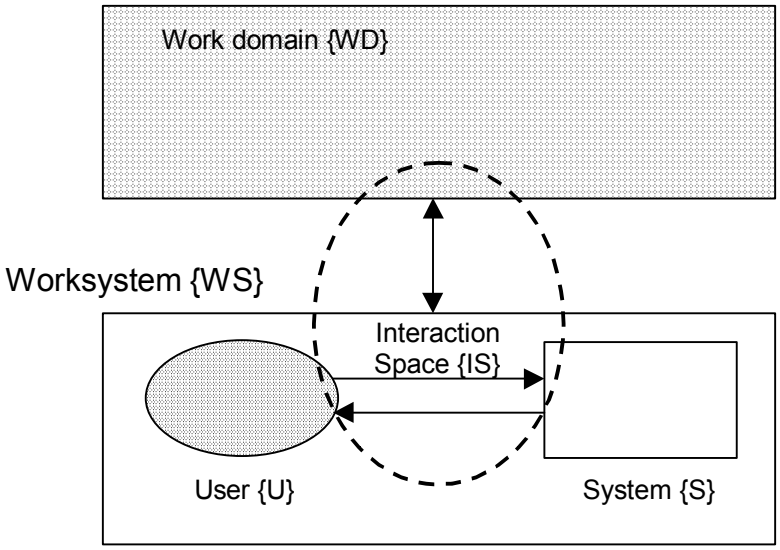

Fig. 9. Interactive work system {WS} and work domain {WD}.

Because "work system" is the key concept of contemporary HCI, and its definition is included in ISO standards, main terminology to be included in the on-line HCI dictionary will also be related to the concept of interactive work system - where quality of user-system interaction in the main topic of the HCI study. Fig. 10. presents the HCI topics proposed by the ACM merged with the contemporary concept of the interactive work system from Fig. 9.

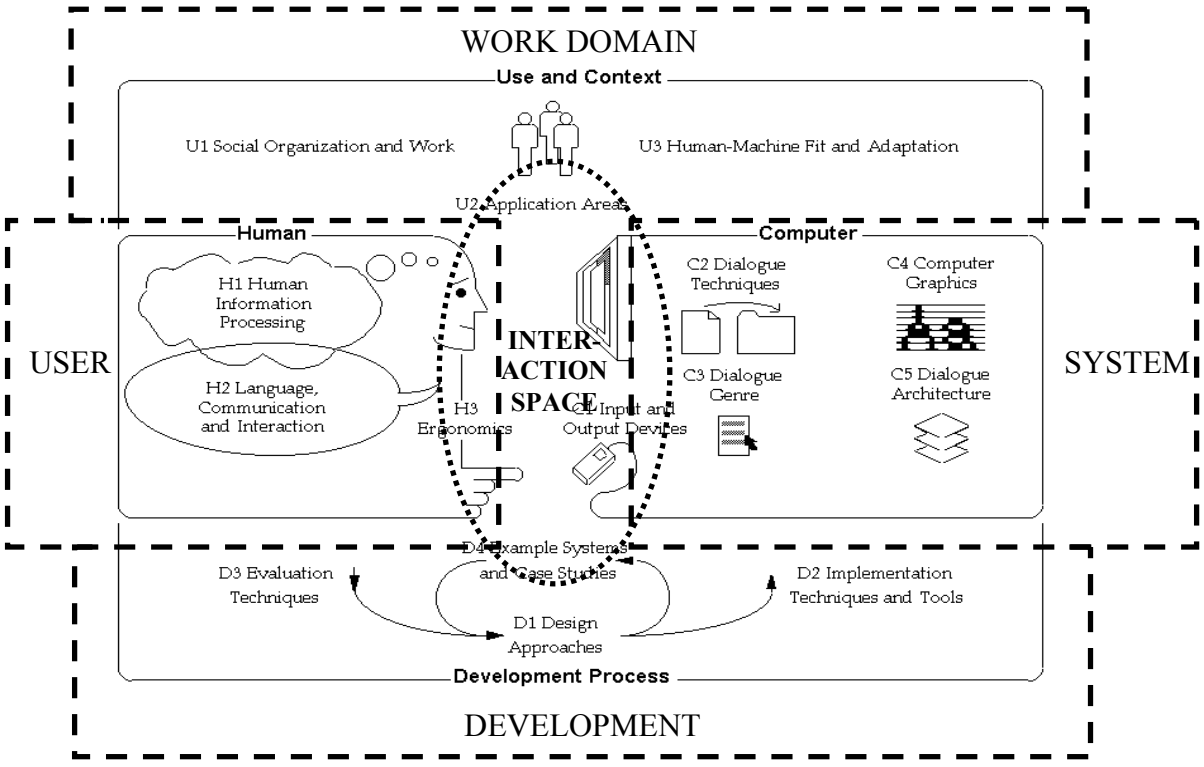

Fig. 9. HCI model by ACM, overlaid with the concept of interactive work system.

In Fig. 10. there are clearly visible key areas in contemporary HCI terminology:
- Work Domain: clients, users, acquirers, organisational and social environment – context of use;
- User and System: end users (system operators), computers (system) and Interaction;
- Development: "creators" – designers, developers, consultants, researchers, managers.

Fig. 11. presents main concepts in a reduced form. It contains main topical areas as categories (sections) of the proposed HCI dictionary:
- Context of use: definitions relevant to work environment and organisational conditions in which task is performed, including also characteristics of local users;
- User: definitions relevant to a person who interacts with the system;
- System: definitions relevant to a combination of hardware and software elements used when carrying out the user's task(s);
- Interaction: definitions relevant to elements and concepts essential for maintaining communication between user and system and concerning
- Development: definitions relevant to such activities as research, design, implementation, as well as managing the project in which the work system has been created
- Work system: definitions relevant to integrated system composed of User, System and Interaction space.

Fig. 11. shows relationships among the topics listed above, which constitute main categories in the proposed on-line HCI dictionary.

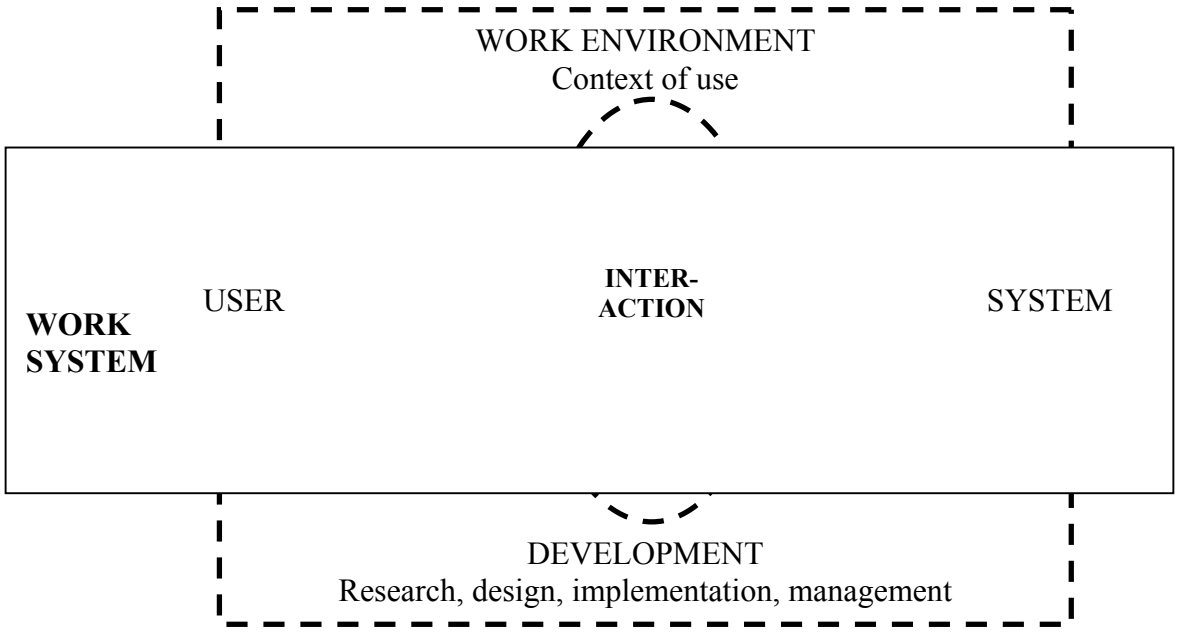

Fig. 11. Proposed key topical areas of HCI dictionary.

The model from Fig. 11. is more generic than models form Fig. 8-10, because it refers also to most recent developments, like mobile computing, computer-supported teamwork or interactive entertaining – and all other uses of computers apart from work. The labels-descriptors used in Fig. 11. aim to include more up-to-date terminology and the fact, that today computers are not only part of a workplace, but are helpful also in the household,

communication, leisure and entertainment. The nature and contents of such an interaction should be also included, as well as any types of interaction that may take place in real settings today, in different contexts of use. For instance when the user travels/moves together with the system (computer), the interaction space moves together with a work system, only environment changes and work domain may alter, depending on the type of performed activity (like work on travel or communicating for leisure).

Further modifications of this model may be expected in the future, however currently it seems sufficient for the purpose of structuring the proposed on-line HCI dictionary. Nevertheless, the model showed in Fig. 11. does not present solution to the basic problem – establishing clear limits of the work system, which still remains a bit "fuzzy" and it may contain selected aspects of work environment (context of use) and of development domain.

3.1.2. Contents description

This section presents the proposed structure of on-line HCI dictionary. It will contain basically two classes of terms (definitions):
- objects: definitions for elements and concepts (ideas, values),
- activities: definitions for processes, operations, tasks.

Other types of terms may be also added if needed. Optionally, the dictionary may also present an illustrative graphics (images), although herewith it is not the main purpose to develop a HCI encyclopaedia.

Following top categories will be used as key sections of the dictionary:
- USER,
- SYSTEM,
- INTERACTION,
- ENVIRONMENT,
- DEVELOPMENT (including Research, Design and Management),
- WORKSYSTEM.

Table 1. presents a proposed structure of the on-line HCI dictionary, including also exemplary terms in selected categories.

The sections presented in Table 1. can be modified according to future developments and its level of detail depends on actual needs. This is a flexible structure and each term (definition) in principle may belong to more than one category because categorisation is to support hypertext-based search and not a linear "table of contents", where each element may appear only once.

Table 1. Proposed structure of the on-line HCI dictionary

Category	*Section*	*Examples*
USER	- user characteristics - information processing - psychological limitations - accessibility - . . .	 - short-term memory - disabled user - Fitt's law - . . .
SYSTEM	- computer graphics - I/O devices - product, software, software product - system stakeholders - . . .	- cursor - artefact - context sensitive help - . . .
INTER-ACTION (SPACE)	- information visualisation, typography - user interaction principles - interaction paradigms - user interface: models, types, elements - widgets, dialogue elements - multimedia, audio, animations - websites, navigation - documents: standards, guidelines, style guides, tools - . . .	 - dialogue box - direct manipulation - feedback - guidance - . . .
ENVIRON-MENT (Context of use)	<u>Context of use:</u> - work, organisation, community - task analysis - ethical and social aspects - . . .	 - workflow - activity - . . .
	<u>Application domains:</u> - office work - communication - websites - other professional areas - . . .	 - geographical data
DEVELOP-MENT	<u>Design principles:</u> - design paradigms - development process - evaluation techniques - usability assessment - user-centred design - . . .	 - design rationale - evaluation - quality in use - quality of worksystem - . . .

	Software engineering: - programming tools, programming techniques - software lifecycles - . . .	 - prototyping - testing - evaluation
	Project management: - quality assurance - business values - marketing communication - project management - . . .	 - software process - usability inspection - . . .
	Research techniques: - experimental psychology - empirical techniques - fields of study - . . .	 - eye tracking - heuristic evaluation - . . .
MISCELLA-NEOUS	- acronyms - . . .	- RAD - QFD

The sections presented in Table 1. are aimed primarily to speed up browsing – if needed – but knowing them by the user is absolutely not necessary to access needed definitions; developing the ultimate systematisation of definitions is not the main purpose of this on-line HCI dictionary. This classification has rather "internal" nature and may be useful for dictionary editors and HCI professionals interested in taxonomy improvements.

3.2. Main functionality of on-line HCI dictionary

As presented in the former section, for an individual user the on-line HCI dictionary would offer two basic functions:
- possibility for easy finding a verified definition with its source,
- comparing different definitions for a given term.

The dictionary will contain only verified and validated contents, what is intended to encourage a systematic use and to build for the website/dictionary a long-term reputation as a credible reference among the users in HCI community. For this reason the website of the on-line HCI dictionary should be professionally maintained and the database with the contests should be regularly verified by competent person(s) – dictionary editor(s).

Following specification roughly describes the basic functionality of the on-line HCI dictionary in terms of accessibility, functions and credibility.

Accessibility:
- on-line HCI dictionary as a public website, hypertext-based, in English,
- access 24x7 by internet, by WWW, any browser,
- website should work also with no graphics,
- public access for the definitions and references,

- contents and descriptions in only English,
- restricted access to editing functions and server/website administration,
- dictionary database on the server, presentation at the client (user browser).

Functions:

Presentation:
- the system displays:
  - a recommended definition for a term selected by the user,
  - the origin (a documented source) for the recommended definition,
  - other definitions (with documented sources) if available,
  - comments from the dictionary editor,
  - related terms from on-line HCI dictionary,
- default screen resolution: 800x600,
- size of screen font selectable by the user in the browser.

Search:
- multiple search will be available for the user:
  - by typing in the searched word in the search window,
  - by scrolling alphabetical index of terms,
  - by scrolling a directory by topic categories,
- optional search:
  - by clicking a topic a graphical bitmap (like the image of the model in Fig.9.or Fig. 11.),
  - by selecting a character letter from a list.

Navigation:
- by browser buttons: “Back” and “Forward” (external navigation support),
- no additional control elements (buttons etc.) for navigation in the system will be needed, except “Back” and “Forward” buttons in the browser and click-able hyperlinks.

Interaction:
- hypertext – clicking the marked object,
- contact with the dictionary editor:
  - ordinary e-mail,
  - feedback form which enables:
    - submitting a proposal for a new term,
    - sending comments about dictionary contents,
    - sending comments about the website,
    - asking a question to dictionary editor(s);
- no contact among users is planned (like discussion list, annotation board etc.);
- registered users can be notified on changes in the dictionary contents.

Editing the contents:
- definitions are added and updated only by system administrator (dictionary editor),
- editor can consult the experts before publishing a definition,
- annotations can be made only by the editor,
- correspondence from the users is filtered by the editor,

- users can send their comments by e-mail (feedback form).

Credibility

- regular update will be provided,
- affiliations to reputable HCI institution,
- competent editorial board,
- trust, reliability and confidence,
- building reputation as the most credible, objective HCI reference,
- premium reference source for new terminology,
- usability higher that average, comparing with similar websites.

The on-line HCI dictionary should generally offer a "competitive advantage" to classical references printed on paper: it will be accessible 24x7 and verified by competent editors and also systematically updated, including the most recent terms and definitions. If manageable, the function of webmaster and dictionary editor could be fulfilled by the same person.

Providing users with a functionality and usability that attracts users to frequent use of this on-line HCI dictionary means that the development of the dictionary requires user-centred project management. Therefore a prototype of on-line HCI dictionary was built and tested, what is presented in the next section.

3.3. A prototype of the on-line HCI dictionary

3.3.1. Construction of the prototype on-line HCI dictionary

In order to validate the concept presented in previous sections, a small-scale prototype was built and tested in series of sample tasks, using a small set of definitions.

The first prototype was implemented on a local disk, storing a minimal set of sample definitions in a local HTML file and not in a database. The working set of definitions was limited to several dozens items just to launch the prototype and to evaluate its basic functionality. The prototype was used as a mock-up for initial discussions aimed on validating the concept of the dictionary with a small group of potential users (selected IPO researchers).

Fig. 12. and Fig. 13. present two typical screens from the prototype system. In the prototype mock-up (developed in plain HTML) no welcome screen has been implemented, in order to focus users' attention directly on the contents and functions of the system, not on graphical design.

The screen is divided into three main areas (Fig. 12.):

- search window (1),
- main panel, in which definitions are presented as a scrollable list (2),
- alphabetical index of terms as a scrollable list (3).

All click-able elements, which are hypertext links, are marked blue and underlined, according to classical principles of hypertext design.

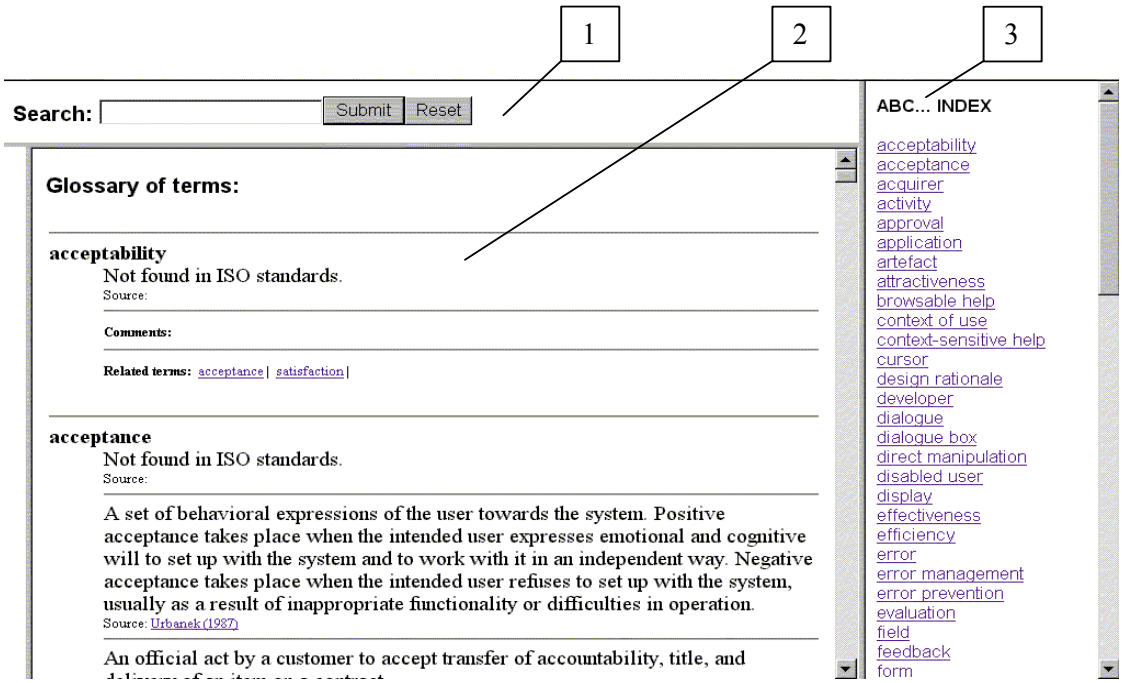

Fig. 12. The screen layout of the prototype on-line HCI dictionary.

The user may select a term by clicking the name from the list (3) in the right panel; then the definition list gets automatically scrolled in the main panel (2), presenting selected term as the first one at the top.

Fig. 13. presents the result of such action, after the term “work system” was pointed by the user and clicked (after scrolling down the list in the right panel). The list automatically scrolls up or down, presenting selected definition on the top of the list in the main panel.

A record of each definition presents (Fig. 13.):
- name of the term (1),
- recommended definition and its source (2),
- other definitions, if available (3),
- comments from the dictionary editor (if available) and the source of the comment (4),
- related terms, also included in this dictionary (5).

As Fig. 13. shows, each term is illustrated by the recommended definition (listed as the first, and possibly the only one) and its source is given, preferably an ISO standard from which the definition was taken. If other definitions also exist, they are given below.

The “Comments” filed the space for additional information from dictionary editor or for important notes excerpted from another documented course (then the link to original source is given, like in Fig. 13.).

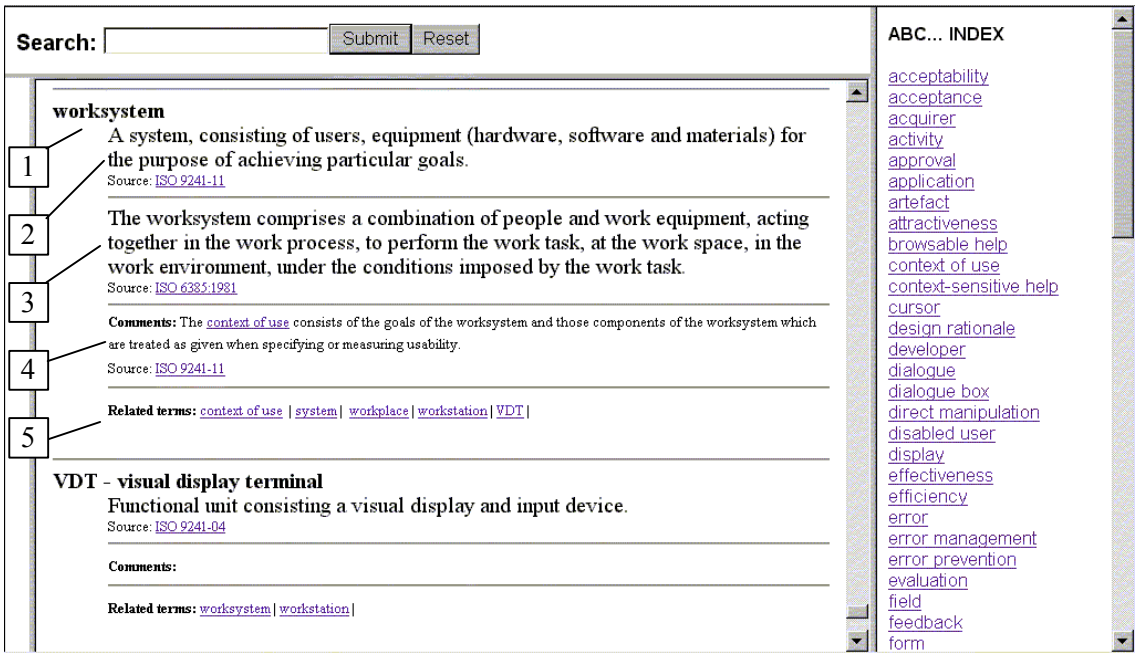

Fig. 13. The elements of definition record the prototype on-line HCI dictionary.

After clicking a link to the source of a definition, a scrollable list of all available sources opens in the main panel (Fig. 14). If electronic version of the source document is accessible in the internet, a hyperlink to the original document is also given.

The concept of dividing the contents of the on-line HCI dictionary into categories, proposed in Table 1., has not been yet implemented in this prototype, as well as the search box function.

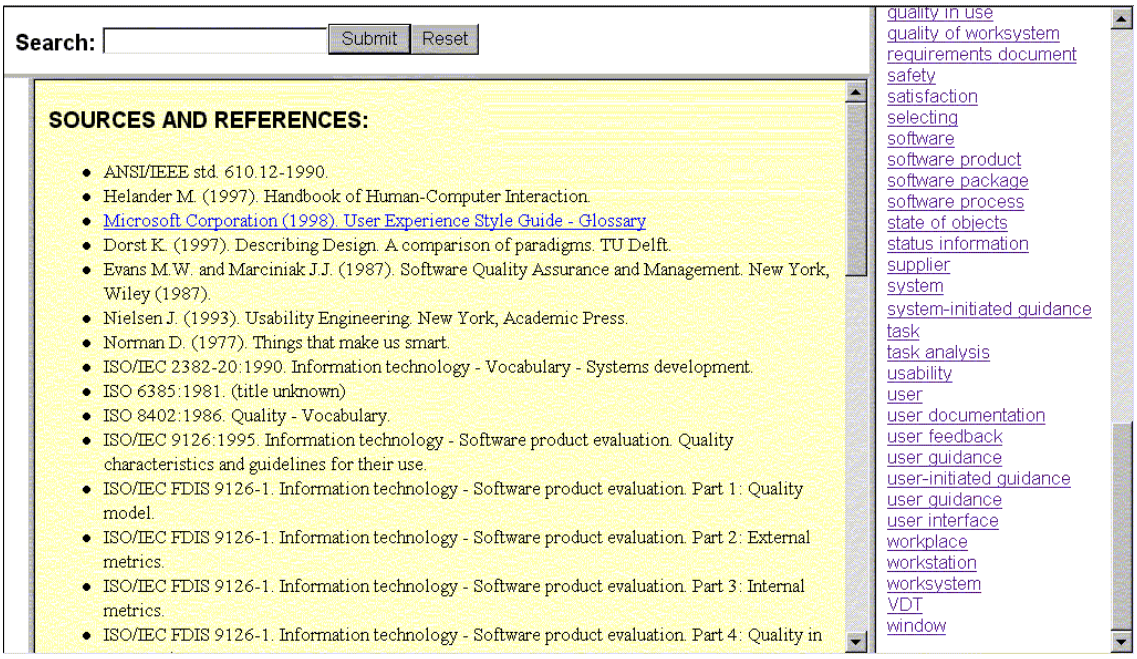

Fig. 14. The “Sources and References” section of the prototype on-line HCI dictionary.

3.3.2. Results of the prototype evaluation

Evaluation of the HTML-based prototype led to following conclusions:

1. Multiple search mechanism (alphabetical listing and scrollable list) worked well, although a scrollable list of full definitions in the main panel is not convenient if default amount of terms-definitions can be even hundreds; main panel should be left for a window which presents only one, currently selected definition.
2. The next prototype (and default construction) should be developed as a relational database, whose contents will be accessible through a web browser and presented in a website.
3. The use of relational database and advanced query functions should enable comparing different definitions and search for inconsistencies; this function should be available only to dictionary "editorial board", not for end users.
4. Apart from the database editor, it is necessary to develop a separate editor for the person acting as the dictionary administrator-editor; this separate editor would serve for editing annotations; additionally, a history recorder would be recommended to trace back subsequent changes made in dictionary contents (who-when-what has changed).
5. Developing feedback channels with end users requires additional database for gathering history of users' comments and suggestions.

Fig. 15. presents a screenshot form a second prototype developed in Microsoft Access 2000. This prototype contains only a part of listed functions and it was developed primarily to evaluate the presentation layer of the on-line HCI dictionary. The contents of the database will be accessible through an internet browser, so the website will provide the presentation and the database the contents of the on-line HCI dictionary.

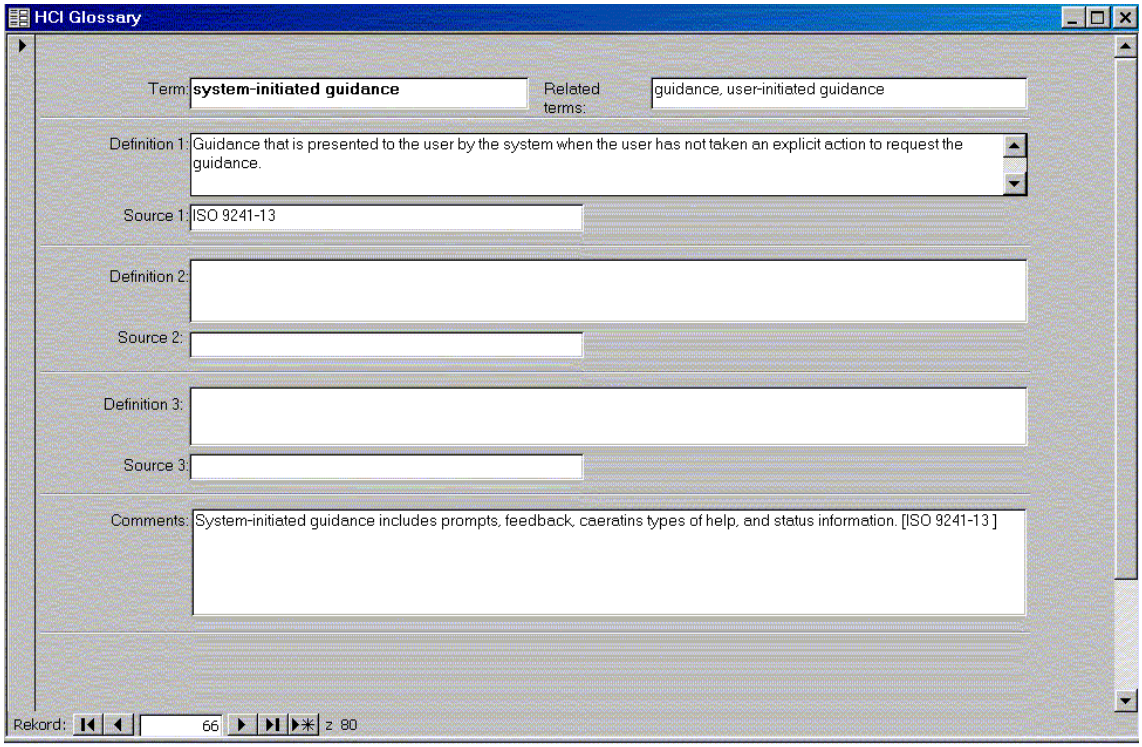

Fig. 15. A screenshot from a prototype dictionary implemented in Microsoft Access.

MS Access 2000 offers a valuable function of building hyperlinks to objects in the same database, and this function is crucial for providing end users with the hypertext-based interaction style, typical for WWW sites.

Fig. 16. presents possible screen layout of the subsequent prototype, which would include the database as the contents and the website as a presentation layer. This screen will be accessed from the main page of the dictionary, which includes typical elements like menus, contact information and statements describing the purpose of the on-line HCI dictionary.

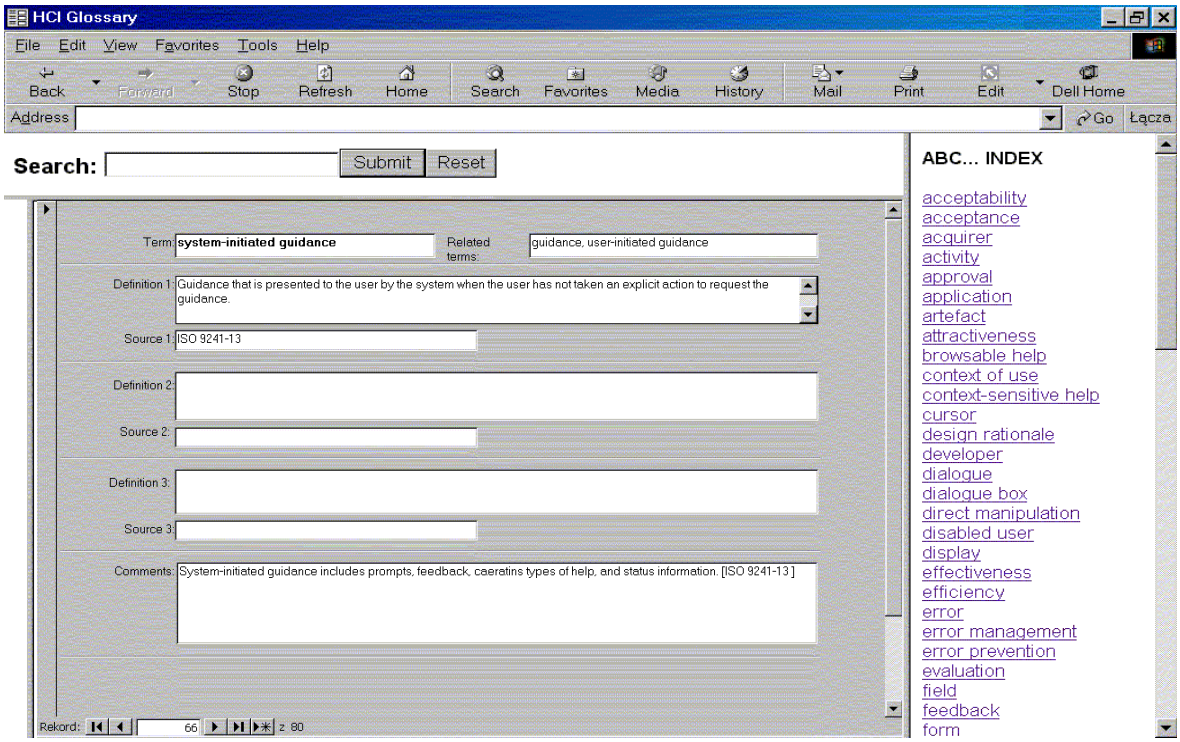

Fig. 16. Proposed screen layout of the improved prototype including a database.

Basing on the performed evaluations of two prototypes, following proposals have been formulated for the next prototypes or default construction of the on-line HCI dictionary:

1. Dictionary contents:
- the initial set of definitions should be primarily based on those available in ISO standards
- later on other verified definitions should be added from HCI handbooks and other sources;
- each term has only one suggested (recommended, highlighted) definition, other definitions only for reference;
- the basic structure of definition record should contain maximally 5 definitions, but empty fields for missing definitions should be not visible to end users;
- it is important that one term may belong to many categories and therefore can appear as a result of browsing in multiple categories.

2. Relational database and the WWW site:
- a centrally administered relational database is the engine of the dictionary, but the web browser of the end user provided settings for presentation format;

- "Usability First" is the on-line HCI dictionary which works this way and can be treated as a recommended and reference solution.

3. Hypertext and the WWW site:
- hyperlinks allow skipping among terms by clicking the screen elements;
- a table of sources and references should also easily accessible by the links from the dictionary;
- no other interaction as typical for WWW sites should be required to use the dictionary.

4. User feedback:
- the multiple feedback mechanism is essential for improving usability of the dictionary, especially e-mail communication with dictionary editor so the users could:
  - submit comments to existing definitions,
  - submit a proposal for a new term;
- submitting annotations should be allowed only for "editorial board" of the dictionary;
- generally, all e-mail correspondence regarding the dictionary contents and form must be filtered by administrator and will be not accessible to end users (no guest book etc will be available).

5. Project management:
- the dictionary project, to be successful, should be the exemplification of user–centred design, that means that iterative development and following users suggestions will be absolutely necessary;
- although some institutional patronage over this project will be necessary to provide resources essential for implementation of this concept, the "ownership" of the dictionary should be rather promoted to HCI community than to nay particular institution;
- however, in the terms of verifying the contents and providing expertise expected from editorial board members, affiliation to well-known and respectable institution having long tradition in HCI research would be highly recommended;
- "Usability First" is the on-line HCI dictionary which can be treated as the reference dictionary and "the main competitor", especially that it represents interesting functionality and high usability.

As it was already noted in several places of this report, the key factor for the success of the proposed on-line HCI dictionary is convincing users from HCI community to frequent use, and building the reputation of this dictionary as a credible and reliable source of reference information.

4. The on-line HCI dictionary in its "context of use"

The proposed on-line HCI dictionary will work as a cognitive artefact, and it will be used in its "context of use", specific for each type of typical user. As already mentioned, target users of the on-line HCI dictionary will be researchers, developers and managers, students and authors. Therefore following scenarios of use can be sketched:

- a researcher wants to review and compare existing definitions of the term "interaction style", to be used consequently in his academic teaching and research reports;
- a developer looks for the strict definition of "design rationale", a term frequently used in project meetings;
- a project manager looks for a definition of "contextual design", a term s/he has heard at the conference;
- a student browses the on-line HCI dictionary in order to clarify the terms needed for the assigned essay or a design report;
- a columnist writing on latest trends in IT consults the on-line HCI dictionary in order to check up the current terminology, including new definitions like "affordance" or "intelligent agents".

Encouraging use of this dictionary for all user groups will build up its reputation as a credible source for reference and a clear sign that HCI has established, coherent terminology used by specialists within the field.

The success of this HCI-community focused dictionary depends primarily on finding right answers to following fundamental questions shaping the on-line HCI dictionary project:

- **What type of words/terms/definitions are really needed?**
  - the amount range: not too much, not too little;
  - the scope range: not too broad, not too narrow.

- **What the glossary should cover?**
  - not too much, explicitly articulated definitions,
  - appropriate level of detail, simple language,
  - contents relevant to other glossaries.

- **Who will create and maintain the glossary?**
  - includes proposing new terms, evaluating submitted proposals, searching for consensus in doubtful cases, consulting the gurus, publishing the outcome and stabilising the contents,
  - it should be respectable institution rather than a group of devoted individuals,
  - it is not the matter of copyright ownership but rather common responsibility for keeping the on-line HCI dictionary up-to-date and accurate.

- **How much binding should be the glossary?**
  - initial motivation to create professional glossary is to support HCI community
  - facilitating professional communication and stimulating communication within community and with other disciplines, would allow sending coherent messages to external world, observing developments ib HCI area,
  - the on-line HCI dictionary is just a tool to formalise professional glossary,

  - definitions available on-line should also include objects needed for scientific reasoning,
  - a hidden purpose of the on-line HCI dictionary (in further perspective) would be connect reflective practice and rational thinking-designing, needed for achieving higher maturity of HCI research.

- **Who should have access to glossary?**
  - the basic glossary should serve for HCI practitioners (target groups),
  - relations with other professional glossaries (like e-commerce etc) is needed to attract also specialists from other disciplines; it would basically enable easier transfer of new terms.

- **Will the glossary develop systematically and in which direction?**
  - will it have its own lifecycle?
  - will the glossary grow in predictable way?
  - how it will be kept under control ?
  - how collaborative editing work may accommodate this glossary closer to industrial practice?

- **Will the glossary affect or change the HCI research culture?**
  - will it be used as reference for systematic use, like a reputable lexicon ?
  - will it be usable as a medium of consistent communication ?
  - will it satisfy very different groups of users (and other stakeholders) ?
  - will it contribute not only to improving the terminology, but also to upgrading HCI status and maturity ?

Finding answers to majority of these questions will be possible only after providing a working prototype to the public usage, and gaining response from target users in HCI community.

Observations of a "competitive environment" suggest that currently there are only two similar dictionaries, addressed to the same HCI audience, which could serve as reference patterns (mentioned in the Section 2.3.7),:

- "Usability Dictionary", which currently offers easy access, the most interesting contents and good integration with other available resources, targeted primarily to usability practitioners in industry;
- "ID-Book Glossary", which is under development yet, however its perfect integration with a website of the interaction design handbook makes it the most attractive source of information for HCI educators.

For the on-line HCI dictionary finding the right place between these two dictionaries would be realistic after careful considering competitive advantages of each "competitor". Permanent affiliating the development of the on-line HCI dictionary and its editors to a well-known publisher of HCI handbooks (and possibly to one of professional HCI associations) would increase the potential of this proposal to be realistic and successful.

5. Conclusions

This report it was aimed to present:
1) the impact of terminology development on the status and maturity of HCI as a research discipline,
2) the framework for developing HCI glossary, which would be available as the on-line HCI dictionary.

The proposed on-line HCI dictionary, if successful and popular among HCI professionals, is supposed to have a positive impact on consistency of terminology used in HCI community as well as to contribute to improving communication within the field and with other disciplines.

This report suggests that for achieving the success the on-line HCI dictionary:
- should be developed and promoted by an institution with a long tradition in HCI research,
- should be professionally edited, it means that a competent editor should care about its contents (or an editorial board, consisting of several HCI experts),
- should present not only high-quality contents, but also outstanding level of usability, resulting from user-centred design applied in its whole lifecycle,
- should be recommended among HCI educators and practitioners to become primary source of reference.

Finding a right institution for this project, providing resources needed for building a working prototype and observing its use will verify the concepts included in this report – hopefully for the benefits of HCI community.

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References

Apple Computer (1998). *The Macintosh Human Interface Guideline*. http://developer.apple.com/techpubs/mac/HIGuidelines

ACM SIGCHI (1997). *ACM SIGCHI Curricula for Human-Computer Interaction*. http://www.acm.org/sigchi/cdg/cdg2.html

Baecker R.M. and Buxton W.A.S. (eds) (1987). *Readings in Human-Computer Interaction: A Multidisciplinary Approach*. Morgan Kaufman, San Mateo, CA.

Cakir A. and Dzida W. (1997). *International Ergonomic HCI Standards*. In: Helander M., Landauer T.K., Prabhu P. (eds) (1997). *Handbook of Human-Computer Interaction*. North Holland, Amsterdam. 407-420.

Carroll J.M. (2000). *Making Use: Scenario-based Human-Computer Interactions*. MIT Press, Cambridge, MA.

Doorst K. (1997). *Describing Design. A Comparisons of Paradigms*. TU Delft.

Evans M.W., Marciniak J.J. (1987): *Software Quality Assurance and Management*. Wiley, New York.

Fox E.A. (1990). *Resources in Human-Computer Interaction.* ACM Press, New York.

Green T.R.G., Davies S.P., Gilmore D.J. (1996). *Delivering Cognitive Psychology to HCI: The Problems of Common Language and Knowledge Transfer.* Interacting with Computers vol. 8 no 1, 89-111.

Helander M., Landauer T.K., Prabhu P. (eds) (1997). *Handbook of Human-Computer Interaction*. North Holland, Amsterdam.

Mayhew D.J. (1992). *Principles anfd Guidelines for Software User Interface Deasign.* Prentice Hall, Englewood Cliffs.

Microsoft Windows (1995). *Microsoft Windows User Experience*. Microsoft Publishing, Redmont, VA. http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnwue/html/gloss.asp

Monk A., Gilbert G.N. (1995). *Perspectives on HCI: Diverse Approaches*. Academic Press, 1995

Moran T.P., Carroll J.M. (1996). *Overview of Design Rationale.* In: Moran T.P., Carroll J.M (eds): Design Rationale. Concepts, Techniques and Use. Lawrence Erlbaum, Malwah, NJ.

Preece J., Rogers Y., Sharp J. (2001). *Interaction Design: Beyond Human-Computer Interaction.* Wiley, New York.

Rauterberg M. (2000). *How to Characterize a Research Line for User-System Interaction.* IPO Annual Report '2000, TU Eindhoven. 66-86.

Shneiderman B. (1987). *Designing the User Interface: Strategies for Effective Human-Computer Interaction.* Addison-Wesley, Reading, MA.

Spool J., Scanlon T., Schroeder W., Snyder C., DeAngelo T. (1999). *Web Site Usability. A Designer's Guide*. Morgan Kaufman, San Francisco, CA.

Urbanek W. (1991). *Software-Ergonomie and benutzerangemessene Auswahl von Werkzeugen bei der Dialoggestaltung*. de Gruyer, Berlin.

Vet de J.H.M. and Ruyter de B.E.R. (1996). *An Inventory of Interaction Styles.* IPO Report No. 1113.

ISO Standards:
ISO 6835: 1981. *Ergonomic principles in the design of work system.*
ISO 9000, 9001, 9002. *Quality process management and quality assurance standards.*
ISO 9000-3: 1991. *Quality management and quality assurance standards. Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.*
ISO 9126-1. *Software quality characteristics.*
ISO 9421 -10-17. *Ergonomic requirements for office work with visual display terminals (VDTs).*
ISO 10075-1. *Ergonomic principles related to mental workload – General terms and definitions*
ISO 11064. *Ergonomic design of control centres*
ISO 11581. *Usage and appropriateness of icons*
ISO/IEC 12207:1995. *Information technology - Software lifecycle processes*.
ISO 13407:1996. *Human-centred design processes for interactive systems*
ISO 14598:1991. *Information technology - Software lifecycle processes*
ISO 14915. *Software ergonomics for multimedia user interfaces.*
ISO 18019. *Design and preparation of user documentation.*
ISO 18789. *Ergonomic requirements and measurement techniques for electronic visual displays.*
ISO 20282. *Usability of everyday products.*

Appendix. The complete glossary.

This appendix contains the set of definitions used for evaluating the prototype of the on-line HCI glossary, described in Section 3.3.

Identyfikator	Term:	Definition 1:	Source 1:	Definition 2:	Source 2:	Definition 3:	Source 3:	Comments:	Related terms:
1	acceptability	Not found in ISO standards.							acceptance, satisfaction
2	acceptance	Not found in ISO standards.		A set of behavioral expressions of the user towards the system. Positive acceptance takes place when the intended user expresses emotional and cognitive will to set up with the system and to work with it in an independent way. Negative acceptance takes place when the intended user refuses to set up with the system, usually as a result of inappropriate functionality or difficulties in operation.	Urbanek (1987)	An official act by a customer to accept transfer of accountability, title, and delivery of an item on a contract.	Evans and Marciniak (1987)		approval, satisfaction
3	acquirer	An organization that acquires or procures a system, software product or software service from a supplier.	ISO/IEC 9126-1 (draft)						supplier, developer,
4	activity	The task performed in a specific context.	unknown						task, task analysis
5	approval	Not found in ISO standards.		Formal recognition of the validity and acceptability of an action or a product.	Evans and Marciniak (1987)				acceptance, acceptability
6	application	Not found in ISO standards							software product
7	artefact	A tangible output, such as a work product, produced from the execution of an implemented process.	ISO 15504						
8	attractiveness	The capability of the software product to be attractive for the user.	ISO/IEC 9126-1 (draft)					This refers to attributes of software (product) intended to make the software more attractive to the user, such as the use of colour and the nature of	

								the graphical design. [ISO/IEC 9126-1 (draft)]	
9	browsable help	Help in which access to help is independent of the current task context. Help topics may be accessed in a variety of sequences, and users can navigate between topics. Browsable help differs form an on-line users guide in that the information within a broad topic area is not restricted to serial access.	ISO 9241-13						on-line help, context-sensitive help
10	context-sensitive help	Help in which the help text or range of help topics is derived from the contextual information associated with the user's task, user's last input, selected object or the current location within the system or application.	ISO 9241-13						on-line help, browsable help
11	cursor	The visual indication of the focus for alphanumerical input.	ISO 9241-16						pointer
12	design rationale	Not found in ISO standards		An expression of the relationships between a designed artifact, its purpose, the designer's conceptualisation, and the contextual constrains realising the purpose. The logical reasons given to justify a designed artifact. An explanation why a designed artifact (or some feature of an artifact) is the way it is. Documentation of (a) the reasons for the design of an artifact, (b) the stages or steps of the design process, (c) the history of the design and	Moran and Carroll (1996)				

				its context.					
13	developer	An organization that performs development activities (including requirements analysis, design, testing through acceptance) during the software lifecycle process.	ISO/IEC 9126-1 (draft)	The person or organization that manufactures a software product.	ISO/IEC 14598-5 (draft)				supplier
14	dialogue	A two way communication between a user and a system to achieve a particular goal.	ISO 9241-10						dialogue box
15	dialogue box	Not found in ISO standard.		A secondary window that gathers additional information from a user.	Microsoft User Experience Glossary				dialogue
16	direct manipulation	A dialogue technique by which the user has the impression on acting directly on objects on the screen, e.g. by pointing at them, moving them and/or changing their physical characteristics (or values) via the use of an input device.	ISO 9241-16						
17	disabled user	A person with disability is an individual who: - has a physical or mental impairment that substantially limits one or more of his/her major life activities, - has a record of such an impairment, - is regarded as having such an impairment. [Other term: Individual with disability]	ISO 11064-3						user
18	display	Device for presenting information that can change with the aim of of making things visible, audible or discriminable by touch (tactile).	ISO 11064-3					ISO 9241does not contain any definition of a display.	
19	effectiveness	The accuracy and completeness with which	ISO 9241-11	A set of attributes that bar on the relationship	ISO	The capability of the software product to	ISO/IEC 9126-		productivity,

		users achieve specified goals.		between the level of performance of the software and the amount of resources used, under stated conditions.	9126:1995	enable users to achieve specified goals with accuracy and completeness in a specified context of use.	1 (draft)		efficiency
20	efficiency	The resources expended in relation to the accuracy and completeness with which users achieve goals.	ISO 9241-11	The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.	ISO/IEC 9126-1 (draft)			For a system which is operated by a user, the combination of functionality, reliability, usability and efficiency can be measured by quality of use. [ISO/IEC 9126-1 (draft)]	productivity, effectiveness
21	error	A mismatch between the user's goal and the response of the system. Errors can include navigation errors, syntax errors, conceptual errors, etc.	ISO 9241-13						error prevention, error management
22	error management	A means to support user in error detection, error explanation, or error recovery.	ISO 9241-13						error, error prevention
23	error prevention	Any means to minimize the probability of the occurrence of errors.	ISO 9241-13						error, error management
24	evaluation	Technical operation that consists of producing an assessment of one or more characteristics of a software product according to a specified procedure. [(Evaluation of software product:)	ISO/IEC 14598-5 (draft)	Systematic examination of the extent to which an entity is capable of fulfilling specific requirements.	IS0/IEC 14598-1 (draft)			The requirements must be formally specified (...) or the requirements may be more general, as when a user evaluated products for comparison and selection purpose. [IS0/IEC 14598-1 (draft)]	software process
25	field	An area on a display in which data is entered or presented.	ISO 9241-17						form
26	feedback	Output presented by the system in reaction to user's input.	ISO 9241-13						interaction, user feedback
27	form	A structural display with labeled fields, that the user fills in, selects entries	ISO 9241-17						field

		(e.g. through choice buttons or radio buttons) or modifies.							
28	function	The implementation of an algorithm in the program with which the user or the program can perform part or all work task. A function does not need to be callable by the user.	ISO 12119 (CD proposal)						
29	goal	An intended objective	ISO 9241-11						
30	guidance	Dialogue elements that aid the user in achieving their desired result. Guidance can aid users in discovering the capabilities of a system, enable the user to generate a plan for accomplishing their goals, assist the user in a ccomplishing a goal, or help the user to manage error situations.	ISO 9241-13						user guidance
31	help	Definition not found in ISO standards.							on-line help, help system
32	icon	A graphic on a visual display terminal that represents an object, action or function.	ISO 9241-16						
33	interface	A shared boundary between two functional units, defined by functional characteristics, signal characteristics, and other characteristics, as appropriate.	ISO 12119 (CD proposal)						user interface
34	interaction	Definition not found in ISO standards.							interactive system, feedback, interface
35	interactive system	Combination of hardware and software components that receive input from and communicate output to a human user in order to support his or her	ISO 13407						system, interaction

		performance of a task.							
36	maintenance	That part of the system maintenance which is concerned with modifying a software package.	ISO 12119 (CD proposal)					Why this definition does not refard software package ?	software process
37	measure (noun)	The number or category assigned to an attribute of an entity by making a measurement	IS0/IEC 14598-1 (draft)						metric
38	menu	A set of selectable options.	ISO 9241-14					Menu options may be presented to the user by means of visual display devices (textually or symbolically), or auditory. A menu may contain multiple action groups, but unless only one choice is allowed across groups, each group would be considered a menu. Highlighted words, symbols and other material in texts are not considered menus. [ISO 9241-14]	
39	metaphor	Use of concepts and properties which are already familiar to the user and from which the user directs input.	ISO 9241-16						
40	metric	The defined measurement method and the measurement scale. (Metric can be internal or external, direct or indirect, and include methods for categorizing qualitative data.)	IS0/IEC 14598-1 (draft)						measure
41	navigation	Opportunity to move within the form from field to field, forward and back, and from one form to another.	ISO 9241-17						
42	object	An entity which is presented to the user	ISO 9241-16						

		during the dialogue. Both entities relevant for the task (such as letter, sales order, electronic parts, wiring diagram) and entities of the user interface (such as icon, window, push button) are regarded as objects. Different objects types are text objects, graphical objects or control objects. It may be possible for the user to directly manipulate some of these objects.							
43	on-line help	Additional user guidance information for prompting, feedback, status, and error messages that can be obtained at the user's initiative or at the initiative of the system. Help typically includes information about features of the system and dialog and how they can be used to aid the user in completion of his/her tasks.	ISO 9241-13						browsable help, context-sensitive help
44	operator	(Control room operator:) An individual whose primary duties relate to the conduct of control functions, usually at a workstation, either on their own or in conjunction with other personnel both within control room and outside.	ISO 11064-3	An individual who monitors or manipulates machines and input/output streams during the execution of a program or system.	Evans and Marciniak (1987)				user
45	package documentation	The product description and the user documentation.	ISO 12119 (CD proposal)						product description, user documentation
46	pointing	Operation of positioning	ISO 9241-16						cursor, pointing

		the pointer on an object or position by using a pointing device.							device, selecting
47	pointing device	Any device that translates a human controlling operation to a controlling operation on the display. Depending on the applied technology not only machine devices but also parts of the human body (e.g. fingers, arms) can currently be used as pointing device.	ISO 9241-16						cursor, pointing device, pointing, selecting, pointer
48	pointer	A graphical symbol that is moved on the screen according to operations with a pointing device. Users can interact with elements displayed on the screen by moving the pointer to that location and starting a direct manipulation.	ISO 9241-16						cursor, pointing device, pointing, selecting
49	product	The part of the equipment (hardware, software and materials) for which usability is to be specified or evaluated.	ISO 9241-17						software product, system
50	product description	A document stating properties of a software package, with the main purpose of helping potential buyers in the evaluation of the suitability for them of the product before procuring it.	ISO 12119 (CD proposal)					The product description is not a specification, and is more specific than a term "system description". [ISO 12119 (CD proposal)]	user documentation, package documentation
51	productivity	The capability of the software product to enable users to expend appropriate amounts of resources in relation to the effectiveness achieved in a specified context of use. (Relevant resources may	ISO/IEC 9126-1 (draft)					Intended to replace term "efficiency" from ISO 9241-11, as a component of quality in use. [ISO/IEC 9126-1 (draft)]	efficiency, effectiveness

		include time, effort, materials or financialcost.)							
52	prompt	A system output requesting input from the user.	ISO 9241-13						
53	prototype	Representation of all or part of a product or system, that although limited in some way, can be used for evaluation.	ISO 13407						
54	quality in use	The capability of the software product to enable specified users to achieve specified goals with effectiveness, productivity and satisfaction in specified contexts of use.	ISO/IEC 9126-1 (draft)					(1) Usability is defined in ISO 9241-11 in a similar way to this definition of quality in use form ISO/IEC 9126-1. Quality in use may be influenced by any of the quality characteristics, and thus is broader than usability, which is hereby defined in terms of: understandability, learnability, operability, attractiveness and compliance. [ISO/IEC 9126-1 (draft)] (2) Quality in use is the user's view of the quality of a system containing software, and is measured in terms of the result of using the software (product), rather than properties of the software itself. Quality in use is the combined effect of internal and external quality for the user. [ISO/IEC 9126-1 (draft)]	quality of worksystem in use, usability, satisfaction
55	quality of worksystem in use	The extent to which specified goals can be achieved with effectiveness, efficiency and satisfaction in a specified	ISO 9241-11					The difference between usability and quality of a worksystem in in use is a matter of focus. When usability is evaluated, the focus is on improving a product while the other	quality in use, usability, satisfaction

		specified contexts of use.						components of the worksystem (user, task, equipment and environment) are treated as given. When the quality of a worksystem in use is evaluated, any component may be subject to modification or improvement.	
56	requirements document	A document containing recommendations, requirements or regulations, for example: - a technical or ergonomic standard; - a requirements list (or model requirements specification) from a group (e.g. a market sector, technical or user association); a law or a decree.	ISO 12119 (CD proposal)						
57	safety	The capability of the software product to achieve acceptable level of risk or harm to people, software, equipment or the environment in a specified context of use.	ISO/IEC 9126-1 (draft)					Proposed as a (new) component of quality in use together with effectiveness, productivity and satisfaction. [ISO/IEC 9126-1 (draft)]	
58	satisfaction	The capability of the software product to satisfy users in a specified context of use.	ISO/IEC 9126-1 (draft)	The comfort and acceptability of use.	ISO 9241-11	Freedom of discomfort, and positive attitude to the use of the product.	ISO 13407 (improperly quoted after ISO 9241-11)		acceptance, acceptability
59	selecting	Operation of choosing one or more objects from a visually presented set of objects.	ISO 9241-16						pointing
60	software	All or part of the programs, procedures, rules and associated documentation of an information processing system.	ISO/IEC 9126-1 (draft)						software product, software package
61	software product	The set of computer programs, procedures, and possibly associated	ISO/IEC 9126-1 (draft)						software, software package, product

		documentation and data.							
62	software package	A complete and documented set of programs supplied to several users for a generic application or function.	ISO/IEC 2382-20						software product, software
63	software process	The process or set of processes used by an organization or project to plan, manage, execute, monitor, control and improve its software related activities.	ISO 15504						
64	supplier	An organization that enters into a contract with the acquirer for the supply of a system, software product or software service under the terms of the contract.	ISO 12207:1995						developer, acquirer, software process
65	system	A combination of the hardware and software elements that the user interacts with in carrying out the user's task(s).	ISO 9241-13	An integrated composite that consists of one or more of the processes, hardware, software, facilities and people, that provides capability to satisfy a stated need or objective.	ISO/IEC 9126-1 (draft) (after ISO 12207:1995)				product, work system, workstation, software product
66	system-initiated guidance	Guidance that is presented to the user by the system when the user has not taken an explicit action to request the guidance.	ISO 9241-13					System-initiated guidance includes prompts, feedback, caeratins types of help, and status information. [ISO 9241-13]	guidance, user-initiated guidance
67	task	The activities undertaken to achieve the goal.	ISO 9241-11	The actions undertaken to achieve the goal in a specific context.	Dorst 1997				activity, task analysis
68	task analysis	Analytical process employed to determine the specific behaviour required for people when operating equipment or doing work .	ISO 9241-05	A detailed description of an operator's task, in terms of its components, to specify the detailed human activities involved, and their	ISO11064-3			Task analysis is not a risk assessment of the workplace, according the legal requirements. [ISO 9241-05]	task

				functional and temporal relationships.					
69	usability	The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions. The components of usability are: understandability, learnability, operability, attractiveness, compliance.	ISO/IEC 9126-1 (CD proposal)	The extent to which a product can be used by specific users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.	ISO 9241-11	A set of attributes that bear on the effort needed for use, and on individual assessment of such use, by stated or implied set of users.	ISO 12119 (CD proposal)	The difference between usability and quality of a worksystem in in use is a matter of focus. When usability is evaluated, the focus is on improving a product while the other components of the worksystem (user, task, equipment and environment) are treated as given. When the quality of a worksystem in use is evaluated, any component may be subject to modification or improvement. [ISO 9241-11]	quality of worksystem in use, quality in use
70	user	An individual that uses the software product to perform a specific function. (Users may include operators, recipients of the results of the software, or developers or maintainers of software.)	ISO/IEC 9126-1 (draft)	The person who interacts with the product.	ISO 9241-11	An individual interacting with the system.	ISO 9241-10	Users may include operators, end users and indirect users who are under the influence of or independent on the use of the software. Usability should address all of the different user environments that the software may affect, which may include preparation for usage and evaluation of results. [ISO/IEC 9126-1]	operator, customer, stakeholder
71	user documentation	The complete set of documents, available in printed or non-printed from, that is provided for the application of the product and also is an integral part of the product.	ISO 12119 (CD proposal)						product description
72	user feedback	Output presented by the system in reaction to user's input.	ISO 9241-13						feedback, interaction, interactive system

73	user-initiated guidance	Guidance that is presented to the user only when the user has taken an explicit action to request the guidance.	ISO 9241-13						guidance, system-initiated guidance, user guidance
74	user guidance	Additional information beyond the regular user-computer dialogue that is provided to the user on request or is automatically provided by the system.	ISO 9241-13						guidance
75	user interface	An interface that enables information to be passes between a human user and hardware or software components of a computer system.	ANSI/IEEE Std 610.12-1990						interface
76	workplace	Arrangement of workstations allocated to one person to complete a work task.	ISO 9241-05						worksystem, workstation
77	workstation	Assembly comprising display equipment, which may be provided with a keyboard and/or input device and/or software determining the operator/machine interface, optional accessories, peripherals and the immediate work environment.	ISO 9241-05	For a given person, the combination of work equipment in a workspace, surrounded by the work environment, constitutes a workstation for the person.	ISO 11064-3	(Control workstation:) A single or multiple working position, including all equipment such as computers and telecommunications terminals and furniture at which control and monitoring functions are conducted.	ISO11064-3		worksystem, workstation
78	worksystem	A system, consisting of users, equipment (hardware, software and materials) for the purpose of achieving particular goals.	ISO 9241-11	The worksystem comprises a combination of people and work equipment, acting together in the work process, to perform the work task, at the work space, in the work environment, under the conditions imposed by the work task.	ISO 6385:1981			The context of use consists of the goals of the worksystem and those components of the worksystem which are treated as given when specifying or measuring usability. [ISO 9241-11]	system, workplace, workstation, VDT, context of use

79	VDT - visual display terminal	Functional unit consisting a visual display and input device.	ISO 9241-04						worksystem, workstation
80	window	An independently controllable area of display, usually rectangular an usually determined by a border. Users may provide input and/or receive output within a window; that is, they may perform tasks within a window.	ISO 9241-12	An independently controllable area on the display screen, used to present objects and/or conduct a dialogue with a user.	ISO 9241-16				