

The Object Permanency Principle in the Usability discipline

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Abstract- The usability discipline is a new and growing area of both the information sciences and ICT technologies, namely for the interactive use of the e-business, professional e-services, and e-government. The Object Permanency Principle – the OPP - is one of the most fundamental principles of the human (may be not only the human) perception, having evolved in our early childhood, from about 6 month age. The usability discipline has not yet realized its importance.

Using the e-services we have to recognize without effort and waste of our time what we see on the screen: the structure of the portal, the content table, the data panels, the forms, the dialogue states. Is it my turn, or the computer's? Is this form the same, that I have already submitted, or a new one?

Our research suggests that the OPP compliancy would be one of the fundamental paradigms of the usability.

This paper analyzes some situations, peculiar to e-services, showing the wrong and the suggested solutions.

I. INTRODUCTION

Keywords: e-service, e-government, HCI, usability, object permanency principle, software technology, Internet, ontology

Terminology: *Portal*: 'electronic content', 'e-content', 'electronic service', 'e-service', 'portal', 'internet service' are equal in our approach. We use the name *portal* for all of them.

Usability is a new and growing area of the ICT technology, namely of the providing information for interactive use.

Nowadays we are overloaded with CMS software technologies, developed by proprietary and open software industry, and used/distributed by system integrators. But, none of them can be regarded as a technically thought-out, theoretically established, exact technology.

On the other hand, the usability discipline so far has no strict conceptual basis – it has no proper set of terminologies and categories to tackle the essence of the usability. The great minds of the usability field (see [1] [2] [3]) gave practical methods to evaluate the portals, and (as in [4]) to design usable portals.

Their focus is basically the e-business, their approach is essentially heuristic.

The ISO standards are hardly referenced in the publications, their impact is low. Reference [5] gives an introduction into their nature.

The Object Permanency Principle – the OPP - is one of the most fundamental principles of the human (may be not only the human) perception, having evolved in our early childhood, from about 6 month age. In our mind there is a mental model of the known objects: their attributes (place, dimension, color, etc.) and their expected behavior. The mental model of the behavior tells us, that the attributes generally doesn't change without physical influence; an object must be one and only one place at the same time, etc. This mechanism of our mind helps us to find, recognize and manipulate the objects, to orient ourselves in the physical world.

This evident principle could help us in the virtual universe also. However, the usability discipline has not yet realized its importance.

Reference [6] describes the object permanency mechanism of the human mind from the point of view of the psychology. In this paper we give a formal definition from the point of view of information sciences, namely the Human Computer Interaction discipline.

II. OUR SCOPE

To point out the sphere of ICT applications we deal with, we introduce some notions, not yet defined in the ICT discipline.

A. Popular vs. professional domain

This is the main differentiation we have to make. The *popular* sphere consists of what we do in leisure time, without liability. In the *professional* sphere our doings may have financial, legal consequences for our livelihood. For example the social networks are mainly in the popular, while e-governments, e-business are in the professional sphere.

The ICT discipline needs a detailed analysis of differences between these two types of behavior of the intended audience.

The ergonomics of the professional sphere is often referred as *vocational* ergonomics.

B. *Routinism, fast comprehension and exclusiveness*

Consider these 3 basic situations of man-machine interactions.

1) **Routinism:** Operators, hand-workers, geeks, specialists need to perform repetitive, familiar operations frequently with the same software, as fast and accurate as they can. The software is generally certified and embedded. Example: use of surgery instruments, or technology control.

2) **Fast comprehension:** Customer, client, visitor and guest go to the portal, use the portal, rarely, occasionally and want to find their way at the portal without any misunderstanding. This is the sphere of public services. E-business or e-government portals are generally used in this situation. Example: find the call for applications in a government's portal, file applications and maintain them later.

3) **Exclusiveness:** It is a special kind of situation mainly of the "Fast comprehension", possibly of the "Routinism": a community purchases a software tool for itself. The members use it; get accustomed to using it and do not feel any comprehension problem. The outsider's claim to use the tool is neglected. This is a kind of IQ-racism, out of our scope.

NB: The experts of information sciences, namely system designers, programmers, being experts, are inclined to the IQ-racism. Therefore the scope of usability is out of their interest. This is one of the reasons for many usability problems.

We deal with basically in the professional, and the fast comprehension sphere. The bold, continuous line shows the world of interactivity, the bold dotted line shows our scope, in Fig. 1.

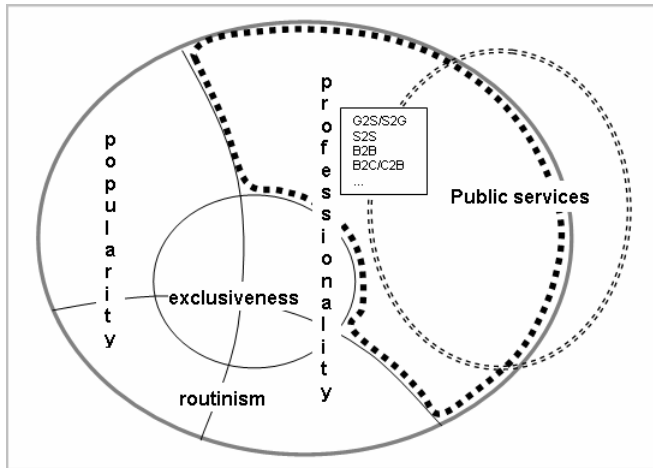


Fig. 1. The spheres of the interactive world. The bold, continuous line shows the world of interactivity, the bold dotted line shows our scope. (There may be public services, not on the Internet, so they have a part out of the interactive world.)

III. THE DUALITY OF VIRTUAL SPACE AND OBJECTS

To discuss the axioms of the OPP, we need some idea of these basic substances.

Let us imagine the virtual space - for the ease - like a tree structure library. Let the objects be our documents, papers, multimedia files, placed somewhere into the space, i.e. on the tree.

Both substances have the main feature: user must have mental model of them. So the user must recognize the objects, and must recognize the localities of an object in the virtual space. E.g. the documents are our papers and the locality in the tree express the state of the papers: draft, final, filled, etc.

The real portals are, naturally, more complicated: the papers generally have no locality in the virtual space, they are stored in a database instead, and their access is via complicated filters. It is evident, that thousands of objects can't be managed without filters and other traditional data-base access technologies. The user can't have mental model of the virtual space of hundreds of localities. However, the usability discipline asserts, that the portal designers tend to overdo this type of database dependency of the CHI. The OPP compliance requires that a portal in addition to managing the object in database has to offer a clear virtual space structure in the HCI. There are a lot of ideas to create a usable space structure even for huge number of things. This is one of the main deficiencies of the recent CMS technologies.

A. *Five axioms of the OPP*

0) **Axiom of the duality.**

The portal must have a simple, comprehensible structure of the virtual space, and simple, recognizable view of the managed objects.

Why do we mean 'object permanency' and not 'object & space permanency' in our principle? For the e-services are mainly intended to manipulate our virtual objects, and less to manipulate their virtual space.

1) **The object is not equal to the link, pointed to it.**

A very frequent error of portal designers that there are loads of links to the same object, moreover, their looks differ. The user can investigate whether they are equal or not.

The linked object must be uniquely identified by the link (generally by the name of the link), placed in the locality of the object. Other links - so called shortcuts, for the convenience, if necessary - must differ from the previous.

2) **The object must be one and only one place at the same time.** (This axiom is similar to the previous. Further investigations will prove, whether they are logically independents.)

The shortcuts to the virtual object are analogous to the mirror of the real world. The designers have to economize in shortcuts, for it is difficult to recognize them. In the real world we can get confused in a room full of mirrors. Other analogy is the guide-post to find a room. They must have an arrow to avoid misunderstandings.

3) No side effects in the universe of objects.

This is also a frequent error of portal designers. In the real world there is no document changing its contents because of the user has modified another. We can repeatedly see this situation in entering forms: an input data entered by the user into one form, automatically appears in the other form or panel. In the designers' opinion this is an evident trick to save the user retyping the data. The OPP, however, requires avoiding this even if via redesigning the forms that they don't contain same data twice.

4) The object, *charged with meta-information*, must be recognizable, and the meta-information must be real time.

The meta-information, in other words the state, can modify the lay-out of the object. This is an effective solution to display the information on the object – rather than its locality in the virtual space. The use of the marks of meta-information must be consequent.

Moreover, the meta-information must be real time. It has much more technical difficulties to realize, and is very dangerous if it fails. The first is the usability problem: the information in the screen may be inconsistent, misleading. More serious problem is the dysfunction - may be directly caused by inconsistency - it goes beyond the usability and the cognitive sciences.

The OPP is analogous to the OO principle in the software development technologies. Unfortunately, the applications don't inherit this evident principle from the technologies. It is very instructive that in the absolutely popular world of MMORPG the virtual reality software technologies easily comply with this principle while in the world of the professional sphere public e-services don't.

In short, the OPP requires that the behavior of the virtual objects mustn't essentially differ from a real one.

B. Documents and panels

In our world, there can be two main ways to display the information that comply the OPP: the document-like and the panel-like ways. We can say in general, that most of the information in the professional use must be document-like. (Document may be an Office file. The HTML page is also document-like, if the designer wants to be.)

On the other hand we have a few situations where we use real time technical information instead. In this case, the representation can be *panel-like*. Here the objects generally are

not documents; they are symbols of a real object, e.g. a shopping basket, or other metaphors.

C. Document-like example of the tax form

The tax return consists of several forms. The user fills his name and ID in the header of the 1st form, and optionally some fields, see in Fig. 2. Then moving on the 2nd form, it has unexpectedly the same appearance than the previous one, because Name and ID were copied automatically into it. So the user hardly recognizes what windows of the screen shows what form. Although, whenever is a very long form ID number on every form somewhere in top right corner, it can be recognized at a glance in the paper form but not on the screen.

The axioms violated in this example:

- The managed objects are not clearly recognizable, distinguishable – 0th axiom.
- The automatic copy causes side effect – 3rd axiom.
- The state is changed when the user begun to fill the form, without toggling meta-information – 4th axiom.

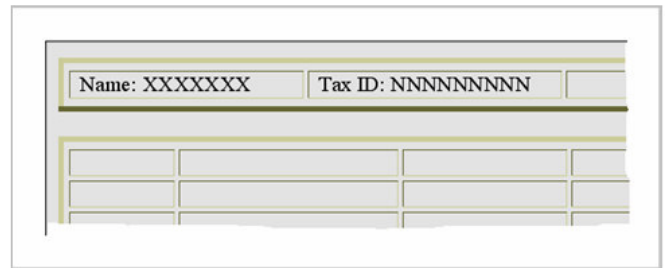


Fig. 2. Illustrates the tax form example.

The proper solution can be:

- To distinguish the forms is suitable the watermark or other pattern is the side of the form.
- The fields of the data coming from automatic copy must be marked to eliminate the confusion caused by the side effect.
- The state change must be displayed e.g. by the change of the tone of the background, or the borders or the frame of the form - immediately when the user starts to fill a field.

D. Panel-like example of teleconference

Every attendant can hear the presenter's voice. On the other hand the attendant's voice can be managed both by the presenter and the attendant. To understand the situation, the presenter and the attendants needs a panel at the corner of their screen like the Fig. 3.

Both characters can click on its switch to reverse its state, and both of them can see the state immediately. If the microphone or the speaker devices are not set up correctly, their icon can be pale.

It is thought-provoking, that we hardly meet this correct solution for this banal problem. Consider some of the innumerable wrong ideas:

- There are no switches in the panel, click to the device – the microphone or the speaker – to toggle its switch. Trouble: The lay-out of the device is reserved to display its set up state, and not the switch’s state. Here its object is *overcharged* with meta-information, so difficult to recognize – 4th axiom.
- There is no connecting line between the devices. Trouble: the connection is not clear in the jam-packed screen. 0th axiom.
- The microphone disappears, when switched off. Trouble: the attendant doesn’t know that there can be the microphone in the virtual space. The object mustn’t appear and disappear – 2nd axiom.
- The presenter switches the attendant’s microphone. May be simpler than to explain for beginner attendant, it is sure. But the trouble: the presenter can’t have so long arm, this is a special type of the side effect - 3rd axiom.

ACKNOWLEDGMENT

To analyze and fix the portal problems by the axioms of the compliancy requirements for the building more usable e-services, is not customary in our days. The system building is mainly up to the designers, architects and programmers, being technology addicted to a certain extent.

The OPP is suitable to discover and fix a special type of usability insufficiencies.

Our analysis is part of the greater investigations, intended to elaborate a formal ontology of HCI discipline. Based on the ontology, check-lists for portal evaluation and methodologies for the design for usability are being elaborated for the professional e-services. Reference [7] describes the skeleton of our HCI ontology.

The ontology is anticipated to contain basic 5-6 chapters, covering and philosophically establishing the HCI of the professional use. One of them is the OPP. The method, being elaborated, is intended to be the base of usability courses, and afterwards the axiomatic basis of the methodology and software technology to build high quality e-services for professional use.

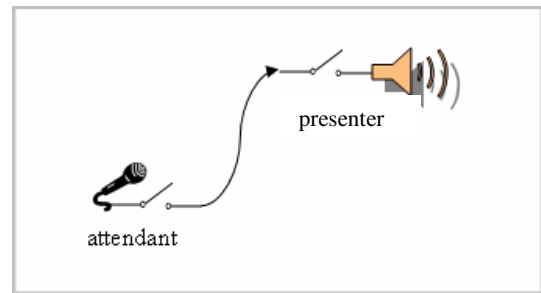


Fig.3. Panel like information for teleconference voice setup of the attendant’s remarks.
Objects are: 2 switches, microphone, speaker, connecting wire

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