Pragmatics in the Usability discipline

András Sebestyén Szőllősy & Gábor Vitályos

Hungarian Association for Applied Linguistics & Language Teaching
a.s.szollosy@gmail.com

Vitályos Consuting, Budapest, Hungary
consulting@vitalyos.hu

***Abstract*- The usability discipline is a growing area both in information sciences and ICT technologies, especially for the interactive use of professional e-services: e-business, e-government, etc. Pragmatics, as a subfield of semiotics, the general study of signs and sign-systems, is concerned with the external context(s) of signs and sign-systems, namely the function(s) and use of signs. The usability discipline has not yet exploited it.**

Using e-services we have to comprehend without misunderstanding and waste of time the communicative situation including the relation between us and the service (its subject and provider). Will they address me, or are they waiting for my response? What consequences the recent message has for the whole communication: does it refuse only the last step or the entire dialogue so far, or is it simply some information, without any specific consequence?

Our study suggests that pragmatics could be a fundamental paradigm for usability.

This paper analyzes some situations, peculiar to e-services, showing wrong vs. suggested solutions, based on pragmatic considerations as applied in HCI.

The paper mainly addresses the conventional ICT technology, namely desktop or mobile PC-s, smart phones, for this is the area of the conventional e-services. However, we can observe, that our claims can be extended to the expanding area of HCI: intelligent vehicles and houses, industrial control systems, geoinformatics, e-inclusion, i.e. for a wide area of Cognitive InfoCommunication.

I. INTRODUCTION

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

Terminology: *Portal*: 'electronic content', 'e-content', 'electronic service', 'e-service', 'portal', 'internet service' are used here as equivalent terms. We use the term *portal* for all them.

Usability is a growing area of ICT technology, namely of information building for interactive use.

In [1] we fixed our scope, introducing the oppositional pair of the notions: *popularity* vs. *professionality*. Here in III. we are going to outline a pragmatic foundation for the introduction of these concepts.

In [1] we also gave an axiomatic approach of the Object Permanency Principle, suggested to be fitting into the HCI design. The main entities introduced in [1] are *objects* and the *virtual space* organizing them. We also used the term there *meta-information* (attribute) that is attached to objects.

Pragmatic principles are much more difficult to deal with: the OPP can be derived by investigating the cognitive representation of the real physical world surrounding us, while the principles of pragmatics also include collective and conventional, social and cultural contexts of human communication. In this paper we make an attempt to extend the scope of some fairly well established principles of pragmatics to HCI. So our propositions can be counted as human requirements for the e-services.

Our assumption is that the behavior of the e-service in the HCI should not essentially differ from that of the human being in human-human interaction.

An 'axiom' in the HCI has five attributes:

1) It declares a basic feature of the HCI, that can't be derived from other statements – as it is in mathematics and natural sciences.
2) An axiom is not a statement of a fact, as it is in mathematics and the natural sciences, but rather the expression of a requirement that the system should meet. (It expresses the authors' vision about the *usable* content.)
3) A content management software can be constructed, that any content built with it will comply all the axioms. On the other hand: one can construct an audit process for any content that will undoubtedly decide whether the content complies the axioms.
4) All the features, items, functions, elements of a *usable* content have to comply the axioms concerned.
5) The set of axioms does not form an axiomatic system. The investigation of the lack of contradictions and interdependencies and of completeness are beyond the recent phase of studies. Of course, later, in the implementing phase of the software technology, these investigation must be performed.

Nevertheless we use the term ‘axiom’ to indicate the logical strictness we strive for building up the concept of the HCI we from these axioms. This is expressed mainly in the 3) and 4) attribute.

In our research we distinguish two basic areas of the usability problems. In the first one the problems are concerning ergonomics. This is a well established area, and these problems are usually managed by HCI designers and programmers. Problems belonging to the other area are concerning semantics, the conceptual correctness of the HCI. The relation between usability and semantic disciplines is not obvious; it is a less investigated area. The usability problems coming from conceptual ambiguousness of the HCI generally are hard to manage by designers and programmers. They generally originate from the conceptual rigidity of the platforms: operating systems and software development tools, and the vagueness of everyday human language use on the other hand.

This is the point where (linguistic) pragmatics enters the scene, because in natural languages the social and cultural context both of the content and the discourse modifies (if not constitutes) the formal semantics of the language – in a specific and systematic way – according to studies in the field of Speech Act Theory. So we may expect from the application of the pragmatic principles discovered in this field of study a proper management of this conflict, a kind of abridgement of the gap between natural and formal language semantics. [2]

Our idea is to establish the requirements for a new portal/service building tool considering the fundamental principles of the HCI. This paper is a small part of this long project focusing on pragmatics.

II Backgrounds

1) Béla Buda in his book [3] describes and discusses the mechanism of human interpersonal communication from the point of view of psychology, as far as it had been discovered by research done by the middle of the 70’s. This field of research in psychology was established and named as the *Pragmatics of Human Communication* by Paul Watzlawick and his co-workers of the Mental Research Institute at Palo Alto in their book of fundamental significance [4]. Their definition of the field followed the line of a classic study [5] by Charles Morris on the *Foundations of the Theory of Signs* published in *International Encyclopedia of Unified Science,* a famous work of the analytic school of philosophy, in 1938; where he divided the field of semiotics, i.e. the theory of signs into three distinct subfields: syntax, semantics and pragmatics. As syntax and semantics had been traditional components of grammar: the study of language – which is considered by some exclusive, but certainly the most important medium of human communication, the great innovation of what has been called since then the Palo Alto school proved to be the introduction of the pragmatic aspect to linguistic communication.

2) Previously in grammatical theories, though implicitly, human languages had been conceived by the analogy of formal languages, as some idealizations intentionally neglecting the natural ‘imperfections’ of human languages. The most important feature of these ‘perfect idealizations’ of human languages – as it was summed up in the works of Gottlob Frege (1848-1925), (mathematician, logicist &philosopher) especially in his two volume big book on *The Foundations of Arithmetic* (!) [6] – is that the semantic interpretation of their expressions is just a computational process to be executed according to the grammatical rules of the language, (without external cues or modifications). But with the discovery and invention of more regular but real languages than so called natural languages, e.g. programming languages, mostly non-linguists dealing with human languages and linguistic communication: psychologists, philosophers, ethnologists, anthropologists and the like began to realize that the more regular formal languages are, the less they are good models of natural languages, at least as humans use it in their every day life. The introduction of pragmatics, the study of the use and external contexts of signs and systems of signs into the study of human language as a sign-system, (once supposed to be the arche- or prototype of all sign-systems) is a result of this process of discovery; that the semantic information is not inherent in language, but it gets constructed during the process of communication.

3) A philosophical *theory of activity* was initiated by a group of Russian psychologists in the 1920s and 1930s, by Lev Vygotsky, A. N. Leont'ev and A. R. Luria. They formulated a completely new theoretical concept to transcend the prevailing understanding of psychology which was then dominated by psychoanalysis and behaviorism. Leont'ev's model of activity is based on the distinction between activity, action and operation, (see in [9]). This new orientation was a model of object-oriented and artifact-mediated action.

III. Popularity vs. Professionality: The Pragmatic Background

The (yet unpublished) paper [7] proposed a classification of the situations of face-to-face interpersonal (verbal) human communication according to two dimensions:

1. Whether the participants belong to
   a. one and the same community: these are the cases of **private** communication,
   b. or to different communities, in which case their communication is obviously **public.**
2. Whether the participants enter the situation
   a. either without any predetermined specific role, or with all of their potential social roles, i.e. with their whole personality and they can acquire specific functions in the course of communication, as a result of which a kind of community may be formed, that they can be adopted as members of. These are the cases of **personal** communication.
   b. or in a culturally predetermined, more or less institutionalized social role or function: these are the cases of transactional communication – as they are called in sociology, but from a pragmatical point of view we prefer to call them **institutional** communication.

As a result we get the following **registers** of communication:

Function \ Community	***Personal***	***Institutional***
Intra-community: ***Private***	Familiar, informal talk	Professional discourse
Inter-community: ***Public***	Civil conversation	Official (most formal) speech acts

For our point the fourth register, which we labelled as Official Speech Acts (OSA), is the most relevant, because in the other three all the participants are potentially equal, whereas these situations are asymmetrical, their participants are rather protagonists: the Officer on the one hand, and the Client on the other. The asymmetry is not just a matter of power; such complementary roles and functions are involved in these situations, as Doctor—Patient, Teacher—Student, Assistant—Customer, etc., last but not least Officer—Client, who only together can realize a culturally—politically—legally institutionalized social interaction, but the protagonists respective functions are not equally institutionalized,-- or more precisely: they are not equally aware of their functions being institutionalized. The function of the Officer: the Doctor, the Teacher, the Assistant etc. is a profession to which s/he is preparing for long years and then s/he is prepared. In the course of communication s/he exercises that profession, whereas the Client entering the situation is just an every day person, who has a problem that s/he wants to solve: s/he is ill, s/he wants to learn something, s/he wants to buy something etc.

Moreover the whole of HCI, even on web 2.0, falls into this register of communication. It is easy to perceive that all the technical innovations in the history of human communication from writing, printing, the press, to the audiovisual media: radio and television, even the computer and the world-wide-web, were initiated and introduced in the Public Institutional sphere of communication, and they were originally the privilege of professionals. Electronic mass-media even nowadays is working on a production—consumption model without direct feedback, where production is an exclusive business of professionals.

III. Our Scope: Communication vs. Operation. The 0^{TH} Axiom

Hereafter beyond the entities of the OPP we are proposing new entities and axioms for the pragmatics of HCI, mainly in the institutional—public sphere of communication.

We refer to the activity manipulating the objects – and, if necessary, the virtual space organizing them –as *operation*. The object and the virtual space is our virtual office, it must be considered to be the user's personal, private environment, even if some elements of them are at a remote site, or in the cloud. E.g. the user's local file system, post box, and the portals to be used all constitute the user's virtual space. Browsing, filling a form, searching, editing a file, a blog, navigating across our virtual space are all operations.

On the other hand, the communication goes on between *actors*. They work independently from each other. A actor may be a person or software known as process or agent in different software platforms respectively. The term 'actor' is preferred instead of process or agent, because it may equally refer to both person and software. Actor can be sender or receiver as in the classic terminology.

This is expressed in the 0^{th} axiom, *the axiom of scope*:

0.1) We don't communicate with our objects or their space - we operate on them. We communicate with actors.

IV. Affairs and Actors. The 1^{ST} Axiom.

The following definitions are motivated by and are analogical with those of activity theory.

Message is meant as in real life or as in the programming environments of operating systems. It is an object, e.g. some sort of a document.

An *affair* is something like the assignement of a 'topic' to different messages (In Gmail it is called a *conversation*, but that term indicates, that it is a pragmatic-thematic unit of discourse, whereas our terminology wants to indicate that it is a unit of an activity, which, of course, may be discourse.) All messages belong to an affair the user deals with.

Activity: is the next larger category of the HCI pragmatics. All affairs belong to a certain activity the user is involved in.

An example: the user initiates or joins an activity by registering to a portal: to a social network or to telework, etc. At the portal a discussion may be going on about a certain topic for a limited time – this is an affair. Within the discussion the actors send messages to each other, and then they close the discussion.

The three-layered make-up of these pragmatical units is parallel to those in activity theory, as it is described in [10]. The Activity/Action/Operation triade of that theory corresponds to our notions of Activity/Affair/Message.

A *response* is a special kind of message. It refers to the message that it is responding to. We have selected the term response instead of answer, because it can refer to any action, not just to speech acts constituting a bit of discourse.

A *reminder* is also a special kind of message. It points to the message the user is reminded of and does not carry any other information.

1.1) All entities: actors, activities, affairs and messages are *objects* in the user's virtual space. (Consequently, each of them and all *meta-information* attached to them must be identifiable on the screen.)

1.2) All messages belong to an affair and all affairs belong to an activity. The information concerning their relations is meta-information.

1.3) The user is an actor.

1.4) The user's environment (the virtual space the user operates on) holds an activity, we call the user's *private activity*. There may be affairs belonging to that activities performed by a software agent, e.g. the antivirus activity, upgrade activity, etc.

1.5) Activities and affairs must have managers. A manager is an actor. S/he is generally the system administrator of the portal. The manager of an affair may generally be the chairman of the discussion or the project manager.

The manager of a *private activity* is the user him-/herself. The manager of certain acivities is a software agent: e.g. the antivirus agent, the upgrade agent, etc.

1.6) The messages have a sender, it is the manager the affair the massage belongs to.

1.7) The activity has to be created and ended, the affair has to be opened and closed by its manager.

Complements to 1.1):

- Messages, being objects, must be stored for later use. The place of storage is conventionally a post box that is a compound object in the user's virtual space.
- Messages can be selected and ordered in the virtual space (on the screen) by any of its attributes. The obvious way of displaying messages: at first to select the affair, then within the affair to order messages by time. We generally use this way to display messages in our postbox, and also other objects, e.g. the blogs.

V. INTERRUPTIONS: THE 2ND AXIOM

Nobody likes to be interrupted while working. A message has to appear on the screen so that it should not disturb the user.

2.1) A message must be able to appear *immediately* on the screen as well as to be displayed for *later reading*.

2.2) A message must not cover the work area, the center of the screen at its *immediate appearance*.

Examples for good solutions to comply with the 2.2):

- The immediate appearance near the tray is generally acceptable.
- The icon of the postbox in the tray displaying the meta-information on the presence of unread message in the box is a good solution. It can be combined by a voice sign of immediate appearance.

NB: The origin of the message: its sender, affair, and activity - for they are meta-information of the message object, as a consequence of the 1.1) axiom - should be obvious at opening the message. It is more important to in the case of immediate appearance.

VI. RELATIONS. THE 3RD AXIOM.

Receiving a message we must identify the speech act it is performing::

A) The message
- just informs us
- asks something from us (if we disobey, we don't block the flow of the affair, i.e. the affair can go on without the asked action)
- order us to do something (if we disobey, we block the flow of the affair – affairs of such kind usually are in public or authority related services). These messages will be referred as *conditional blocking* messages.

B) The message
- may (or must) be answered
- mustn't be answered.

C) The message is important or not (according t the sender's intention).

D) The sender
- is a software agent
- is a depersonalized officer
- is a private person or an officer. (Cf. with the table in p. 3)

These are the informations of relation – meta-information of the message. A) and B) can usually be found out from the text of the message; C) is coded by a flag in the well known SMTP clients; D) can be inferred usually from the sender's alias name.

Using professional e-services, we want to acquire this information without a too long study of the text of the message.

3.1) Meta-information of relations is to be obviously coded in the header of the message. It must be seen without a deeper analysis of the message text, and it could be a key for sorting and search of messages.
3.2) Blocking messages must appear immediately.

VI. EXAMPLES

Finally we assess some softwares in terms of their compliance with the above mentioned pragmatic principles and axioms.

Generally we have to face the lack of the activity/affair management in most software platforms and technologies. (We can find it within some applications, but it rarely works out of the scope of that very application.)

1) Problems of actor identification

The *mail address* is unique over the World Wide Web, so unambiguously identifies a post box, but not all the *actors*. The *alias name* at the SMTP technology is not unique and does not identify anybody. Moreover, an individual may behave as different actors in different situational contexts: e.g. once as an employee, once as a private person and then as a functionary in a community service. To avoid mixing these different actors, it could be a good solution to use compound aliases as:

Peter Smith – Company Hungary
Peter Smith – private
Peter Smith – Society for …

Peter Smith must compose and give these aliases to himself, in agreement with the system administrators of the Company and the Society.

On the other hand, to distinguish more Peter Smith – private-s is the only perfect solution is the digital sign. (The alias collision within the great firms is generally avoided by system administrators.) The digital sign is suitable for technical use, and not for HCI. The solution for HCI may be to give a third part to the alias. This part must be given by the addresse user -- only if it is necessary due to name collision. The user can do it when Peter Smith introduces himself to him. To make the distinction, the third part can be associated to the Smith's digital sign (that is the perfect solution), or to the activity or affair Smith usually is working in. The latter is not perfect, but it is sufficient, because the collision of private aliases is very unlikely in an activity or an affair.

Now there is no widespread convention for this sort of administration of the actors. Moreover, there is no software allowing a solution to this problem, i.e. to perfectly comply the axiom 1.1), consequently all parts of 1.x).

2) Problems of pop-up windows

For the sake of simplicity, the following examples deal with the user's local environment, not with the portal. After all the problems are similar and nowadays the user must use the complicated local environment of the PC.

To keep the operating system or other software up to date, the user periodically faces messages to download and install upgrades. These messages ought to initiate affairs in the update activity of a specific software.
Figure 1. shows one of the numberless interrupts for an update request, appearing in the in the very centre of the screen just when the user sets about working.
It is not a favourable solution for an immediate appearance.

- It covers unexpectedly the working area of the screen – violates the axiom 2.2).

Figure 2. shows that my colleague X Y – who is an object in my virtual space - has changed his/her status. Good solution for a transient message, appearing humbly in bottom right corner of the screen. But:

- The lack of the activity/affair management in the user environment causes the violations all parts of the 1st axiom.

Figure 3. shows a blocking message. Except the problems mentioned above, we face:

- We may *know*, but we do not *see* that it is a blocking message. It violates the axiom 3.1).
- In this situation the axioms 1.1)-1.2) are very important, for we have to understand, which affairs are blocked now, while we can go on working with other affairs.

3) Problems of SMTP mail or web mail

The general lack of activity/affair management causes the problems seen above. A further problem is the following:

The postbox mechanism roughly speaking satisfies some parts of the axiom 1.1). We can select, group and order the messages for a certain extent. But the management of the postbox with SMTP-client and with browser is not integrated. Strictly speaking this is not a problem of pragmatics but that of object management, which will be discussed later in another paper.

The 'topic' item at the SMTP header can't be used to identify the activity or the affair, for it is a free text.

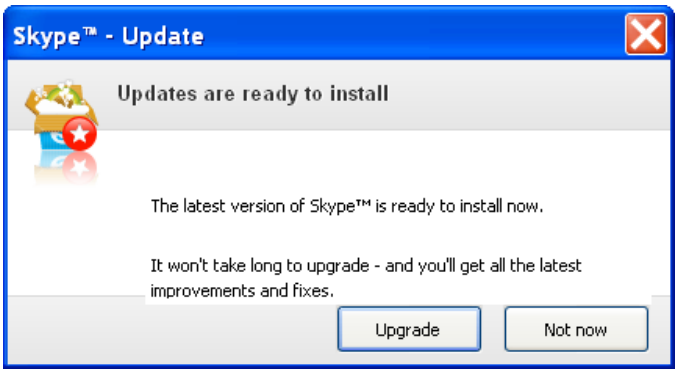

Fig. 1. Example of an ill-mannered immediate appearance

Fig. 2. Good solution for the appearance of the *transient* message

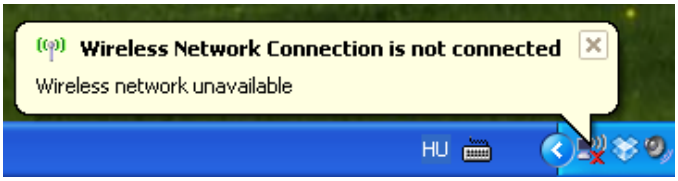

Fig. 3. Example of a *blocking* message

Closing the introduction of this few examples we feel obliged to admit, that first in the development of Google's gmail, and then in Microsoft's hot mail we can discover efforts for the solution of these problems.

VII. Summary

To demonstrate the relation of Watzlawick's and others' pragmatical axioms and principles to the HCI axioms suggested in this paper, we can sum up that

The 0th axiom corresponds to the Watzlawick's axiom 1. (the 'can not not' axiom) of pragmatics in [4].

The 1st axiom relates the mechanisms of communication to the actors and their operations on the virtual objects in the HCI, and it is motivated by activity theory [9].

The 2nd axiom corresponds to axiom 3. (the 'punctuation' axiom) in [4].

The 3rd axiom corresponds to axiom 2. and 5. (the 'content and relationship' and the 'symmetric and complementary') in [4].

We emphasize that the formulation of our axioms is rather heuristic and not rigorous enough to establish the algorithmic correctness (lack of contradictions, independency, etc.) their further investigation. These aspects are beyond the scope of the present paper.

Note

Our present analysis is part of a greater research project, intended to elaborate a formal ontology of HCI discipline of the professional use. Based on the ontology, check-lists for portal evaluation and methodologies for the design for usability are being elaborated the professional e-services. Reference [8] describes the skeleton of our HCI ontology.

The ontology is anticipated to contain 5-6 basic chapters, covering and philosophically establishing HCI for professional use.

The 1st paper was the [1] on OPP in the HCI.
The 3rd paper planned will be on Activity Theory in the HCI.
The 4th paper planned will be on Object Operation Mechanisms in the HCI.

The method, being elaborated, is intended to be the base of usability courses, and afterwards the axiomatic foundation of a methodology and software technology to build high quality e-services for professional use.

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