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From Communicative Action Theory to Socio-Technical Artifacts: Presentation of Three System Prototypes

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1 Introduction

Social issues have become as critical as technical ones for the designers of modern socio-technical systems that enable social interaction of any type such as group discussions, group writing or others. Design science research in the Information Systems (IS) discipline deals with the construction and evaluation of IT artifacts (Simon 1996; Hevner et al. 2004), which have impacts on people and organizations. Hence, design research encompasses socio-technical design, within which design issues are not merely concerned with how to make technology more efficient or how technology affects society, but also with issues such as how social concepts can be integrated in technology design, use and evaluation or how social ideals can enlighten technical design and evaluation. The combination of social and technical knowledge is necessary in order to reduce the socio-technical gap (Ackerman 2002), and for this purpose, social theories can be of practical value. In line with the view that ‘nothing is as practical as a good theory’ (Lewin 1945), we think that theories are practical as they allow knowledge to be accumulated in a systematic manner and this accumulated knowledge illuminates professional practice.

The objective of this paper is to present the application of concepts from Habermas’ (1984) critical social theory. Klein and Huynh (2004) discuss the implications of Habermas’ critical theory for IS discipline, and note – with reference to the citation analysis of Jones (2000) – that Habermas is probably second only to Giddens in the frequency with which IS researchers choose his writings over other social theories on which to found their

studies. Habermas' theory of communicative action (i.e., an action which is striving to achieve mutual understanding) is one of the theoretical foundations of the language-action perspective on system design (Goldkuhl a. Lyytinen 1982; Winograd a. Flores 1986). It is therefore highly appropriate to consider Habermas' ideas in the realm of design science research and demonstrate how they can be integrated into the design of technological artifacts. As Klein and Huynh (2004) point out, demonstration of the applicability of Habermas' theory is still lacking in IS research. An exception is the work of Heng and de Moor (2003), which applies Habermas' theory of communicative action as the guiding principles for developing an internet-based tool for collaborative authoring. However, although the system design follows - at a general level - the spirit of a Habermasian discourse to enable and support electronic communication, it does not consider the broad spectrum of discursive concepts and details of his theory.

This paper moves beyond a high-level theoretical discussion of the value of Habermas' critical social theory for IS to its implementation in prototype systems. In my earlier works, I have already proposed theoretical constructs and models based on Habermas' ideas (Yetim 2005, 2006, 2007, 2008a/b). Here, I present three prototypes that represent the implementation of these constructs and models in different application areas. The applications are concerned with supporting group discourses, managing usability guidelines, and providing justified product recommendations. This paper claims to make a practical contribution to the design of socio-technical systems by demonstrating the applicability of Habermas' ideas, by illustrating both how theory informs the technical design and how practical challenges affect the realization of the theory.

The organization of this paper is as follows: Section 2 provides the theoretical background by briefly introducing the design-science research perspective and the relevant concepts from Habermas' theory. Then the subsequent sections describe the purpose and functionality of three system prototypes, and also give a tentative view of how to continue in the future. Section 3 presents the first prototype *DISCOURSIUM*, which allows critical discussion on many aspects of information communications. Section 4 describes the second prototype *GuideMan*, which deals with the management of usability guidelines. Section 5 is concerned with the third prototype *JustPro*, which employs Habermas' concepts to organize justificatory knowledge for product recommendations. Finally, section 6 presents some conclusions.

2 Background

2.1 Design Science Research in Information Systems

Two paradigms characterize much of the research in IS: behavioral science and design science. The behavior-science paradigm seeks to develop and verify theories that explain or predict human or organizational behavior. The design-science paradigm, with its roots in engineering and the sciences of the artificial (Simon 1996), seeks to extend the boundaries of human and organizational capabilities by creating new, innovative artifacts (Hevner et al. 2004).

The term artifact is broadly defined in design science research. Artifacts can be *constructs* (vocabulary and symbols), *models* (abstractions and representations), *methods* (algorithms and practices), and *instantiations* (i.e., implemented software systems) (Hevner et al. 2004); they can also be organizations, policies, and work practices (Simon 1996). Constructs, models, and methods permit the representation, analysis, understanding, and development of successful information systems within organizations. Instantiations show that constructs, models, or methods can be implemented in a working system. Thus, the prototypes to be presented in this paper fall solidly within the realm of design science research.

In design science research, there are different views on the roles and constituents of a design theory (see, Carroll and Kellogg 1989; Walls et al. 1992; Markus et al. 2002; Goldkuhl 2004; Venable 2006; Gregor a. Jones 2007). Yet it seems to be widely accepted that design theories differ from theories in other natural and social sciences because design theories tend to be prescriptive rather than descriptive. Gregor (2006) argues for a theory for design and action as a special type of theory that says ‘how to do something’ as opposed to other types of theory where the primary purposes are analysis, explanation or prediction. It has also been argued that design theories provide the rational foundations for design characteristics and explain why artifacts should possess certain features or characteristics in a functional or teleological way (Pries-Heje a. Baskerville 2006). They are the prescriptive basis for explaining means by which artifacts will achieve the intended ends (Simon 1996). Design theories can be anchored in reference theories usually taken from the natural or social sciences.

For the purpose of this paper, the relevant issue is: What a role can language-action theories such as Habermas’ theory play in design?

2.2 Language-Action Perspective on Design

The so-called Language-Action Perspective (LAP) is one research stream in IS, for which both Habermas' (1984) theory of communicative action and the speech-act theory (Searle 1969) serve as the theoretical basis.

Regarding epistemological aspects, Habermas' theory does not assume that the truth of a scientific theory is its correspondence with some objective reality. Instead, it recognizes that truth has to be defined through a discourse, and emphasizes "the logic of justification." It recognizes the uncertainty and fallibility of human knowledge. Therefore, different theories and methods need to be constantly debated (Klein a. Lyytinen 1985).

In the traditional approaches information systems are seen as repositories storing representations of facts about the real world. The important goal from this perspective is to achieve a correspondence between the representations in the system and the facts in the world. In contrast, LAP does not conceive information systems as technostructures that store hard facts about the objective reality. Instead, it sees them as influenced by knowledge-based rules which are always socially and technically conditioned (Goldkuhl a. Lyytinen 1982; Winograd a. Flores 1986). From this perspective, an IS is regarded as a vehicle for social action and communication within an application context. Systems development is conceived as a social process. Communication comes to the fore in this approach. It sees the need for sense-making or mutual understanding through the use of rational discourse, and hence vehicles are developed to overcome obstacles to free and undistorted communication (Klein a. Huynh 2004). The goal of systems development is a system which would not only support rational discourse but also mutual understanding for all its users (Klein a. Lyytinen 1985). In other words, LAP emphasizes the communicative and discursive orientations related to the system itself and its development process. It assumes: if social and pragmatic aspects are not sufficiently taken into account during analysis and design, one might end up with an application system that may fail to be considered as legitimate and socially acceptable.

Klein and Lyytinen (1985) argue that critical social theory is not a research methodology in the sense that it tells us how to do research. It emphasizes the role of interpretive and hermeneutic method in research which has a social content. Winograd (2006) states that LAP does not allow the designer to predict system behavior and resource demands and to design effectively for these factors. Rather: "Its value is as an orienting theory, not applied as a set of calculations, but shaping the background of interpretation a designer brings to understanding and envisioning the human situation" (ebd., p.72). Like any perspective, LAP provides a standpoint for

raising questions, for anticipating breakdowns, and for inventing opportunities. In the field of interaction design, there are opportunities of multi-user shared participation in education, entertainment, and commerce, and some of the central concerns in these applications are those addressed by LAP: trust, commitment, and bridging differences of background and interpretation. Winograd (2006) concludes that: “By shining its spotlight on essential qualities of language and information, LAP can introduce simplicity to a design – not by reducing the human phenomena to simplicity, but by providing a uniform and understandable structure that can support human activity in all of its richness.”(p.73).

Goldkuhl (2004) points to some design approaches (e.g., Action Workflow, DEMO or BAT) which have, more or less, theoretical roots in language action theories. He argues that the external language action theories function as kernel theories (Walls et al. 1992) for the design approaches. The theoretical constructs in these theories (as e.g. in speech act theory (Searle 1969) function as conceptual and explanatory grounding for parts of the mentioned design approaches. Habermas’ (1984) work treats issues of normative rationality, which then function as a general value grounding.

Human and social concerns were raised in many other socio-technical approaches (e.g., Hirschheim et al. 1996; Friedman 1997; Yetim 1998). They encourage IS professionals to consider different, often conflicting, interests and to ensure that democratic values are incorporated in design processes. In such approaches, the utility of the designed artifact is not merely stated in terms of its efficiency or effectiveness but also in terms of other criteria such as its elegance (aesthetics), ethicality, legitimacy, etc. Habermas’ Theory is often referred as the theoretical foundation for introducing democratic values into design processes as well as concepts and structures for supporting deliberation and transparency in design. In what follows, we briefly outline how Habermas’ theory is used in this paper.

2.3 Concepts used from Habermas’ Theory

In his theory of communicative action, Habermas (1984) regards communication as a way to reach a shared understanding and specifies the mechanism that makes rationally motivated agreement possible. His theory deals with universal aspects of human action, communication and reflection. Habermas argues that communicative (and also non-communicative) actions of actors inherently involve validity claims (e.g., comprehensibility, truth, rightness, sincerity, efficiency or ethical goodness) that are open to both criticism and justification. In order to arrive at a shared understanding the speaker and hearer must agree on validity claims. When validity

claims are challenged, actors switch from communication action to *dis-course*, i.e. to a reflective mode of communication, in order to 'solve' the dissensus by means of argumentation. Habermas provides a set of dis-course types for specific validity claims. He aligns different types of valid-ity claims with different types of justificatory discourse. Cogent arguments must employ somewhat different sorts of reasons to justify different types of claims. Toulmin's (1958) model of argument is used as the basis for ar-gumentation in discourses.

As mentioned before, Habermas' theory can be applied to the develop-ment process of a system (e.g., it can be used during analysis and design) to promote mutual understanding about the desired features of the system. In line with the prototyping approach to information systems development, the prototypes presented in this paper have been developed thorough an it-erative rather than a systematic process. The design processes involved communicative activities such as presentation of proposals, feedbacks, critical discussions or consensus formations. Yet, this is not the way this paper uses Habermas' theory. Rather: Habermas' theory plays a role in the designed prototypes themselves by providing procedures and/or theoretical constructs to be implemented. They thus function as conceptual, explanat-ory or value grounding for parts of the prototypes. Many of Habermas' concepts have been used in the architecture of a meta-communication model (Yetim 2005, 2006).

Three prototypes presented in this paper implement the following con-cepts from Habermas' theory:

1. In *DISCOURSIUM*, Habermas' theory provides orientation to struc-ture human communication and reflection. In particular, the validity claims (including rationality standards) serve as a set of clarification issues for critically evaluating information and communication ac-tions. In addition, types of discourses provide orientations for sorting and mapping controversial positions according to the logic of the is-sue at hand.
2. In *GuideMan*, many validity claims are regarded as usability issues in the context of Human-Computer Interaction (HCI) and are used as categories to organize usability guidelines. In this way, guidelines can inform the designers/evaluators about how to satisfy expectations as-sociated with different validity claims, e.g., to achieve comprehensi-bility or truthfulness when designing communication.
3. In *JustPro*, the set of diverse discourse types is used to categorize jus-tificatory knowledge for product recommendations.

The remainder of this paper presents the three prototypes and describes the usage of the theoretical concepts in each of them. Instead of providing

the details, presentation of each system will be limited to a brief description of its purpose, scope, and contribution, followed by a discussion of the basic functionality of the system as well as information about the current state, evaluation aspects, and future issues. It should be noted in advance that all three prototypes have been developed by using open source technologies (Apache Server, PHP, and MySQL).

3 DISCOURSIUM: A Tool for Supporting Structured Deliberation

3.1 Purpose, Scope, and Contribution

DISCOURSIUM can be conceived as both a tool and a methodology for facilitating structured deliberation on and critical examination of information. The relevance of discourse-oriented approaches and tools for supporting *sensemaking* activities (i.e., capturing, comprehending, and managing competing interpretations and arguments) has already been articulated (e.g., Uren et al. 2006; Yetim 2006). Previous research has also shown that adding structures to online discussion environments improves the group's ability to reach consensus and make higher-quality decisions (Farnham et al. 2000). The amount of information communicable via internet and the possibility to communicate across global contexts pose challenges, ranging from how to communicate comprehensible, relevant and valid information to how to accommodate diverse ethical values. DISCOURSIUM aims to enable discursive and structured examination dialogues on information and communication objects (e.g., texts, information design, etc.). It supports the reflective treatment of a set of possible communication breakdowns and enables participants to achieve agreement on the forms, contents and norms of information and communication. DISCOURSIUM differs from other discourse-oriented technologies in that it provides a set of theory-based examination issues and related discourses (consult Yetim (2007) for a review of some related works).

3.2 The functionality of DISCOURSIUM

DISCOURSIUM implements the meta-communication architecture (Yetim 2005, 2006), which is mainly based on Habermas' theory of communicative action. The architecture distinguishes two levels: the *conversation for clarification level*, which provides a structure for systematic conversations about basic issues, and the *discourse level*, which provides a structure and

orientation for disputing controversial positions. Distinguishing between clarification and discourse levels allows users to separate “just talking” from argumentative disputes.

However, as argued in (Yetim 2007), although theoretically reasonable, from a practical point of view the full implementation of the two levels with dialogical discussion at each level may add further complexity. For example, practicing threaded discussions at each level may lead to inefficiency. In addition, as each discourse type is responsible for examining specific types of controversial claims, switching between discourses may in practice become challenging for the participants, and the management of the complex relationship between the discourses also requires additional cognitive and technical efforts. Moreover, the implementation of two levels may have a negative effect on the usability of such a system, as it would require participants to possess communication knowledge, i.e. to know which discourses are for which types of controversies in order to place their positions/arguments in the appropriate discourses.

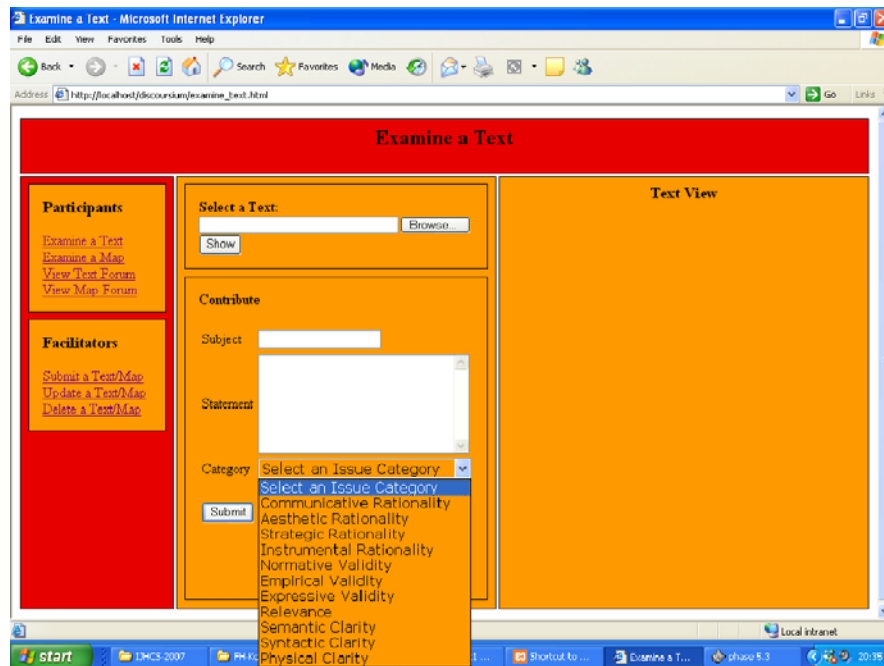


Fig. 1. Screenshot for examining a text

These challenges motivate the exploration of alternative design. Without giving up the theoretical idea of separating discourses for different validity

claims, for practical reasons the following compromise solution has been implemented in DISCOURSIUM: Only the clarification level from the model is implemented to enable participants to participate in critical examination dialogues for examination of both information objects and argument maps. The main activities involve: (1) Users examine an information object; (2) A moderator creates argument maps for each discourse type; (3) Users examine the maps.

As shown in Fig. 1, participants can upload a text or other object to examine and provide their contributions. At this level, the system provides participants with clarification issues, which participants can select to make the semantics of their contributions explicit. This functionality of the system is similar to that of a discussion forum, with an option that participants categorize their contributions by selecting one issue from the set of issues.

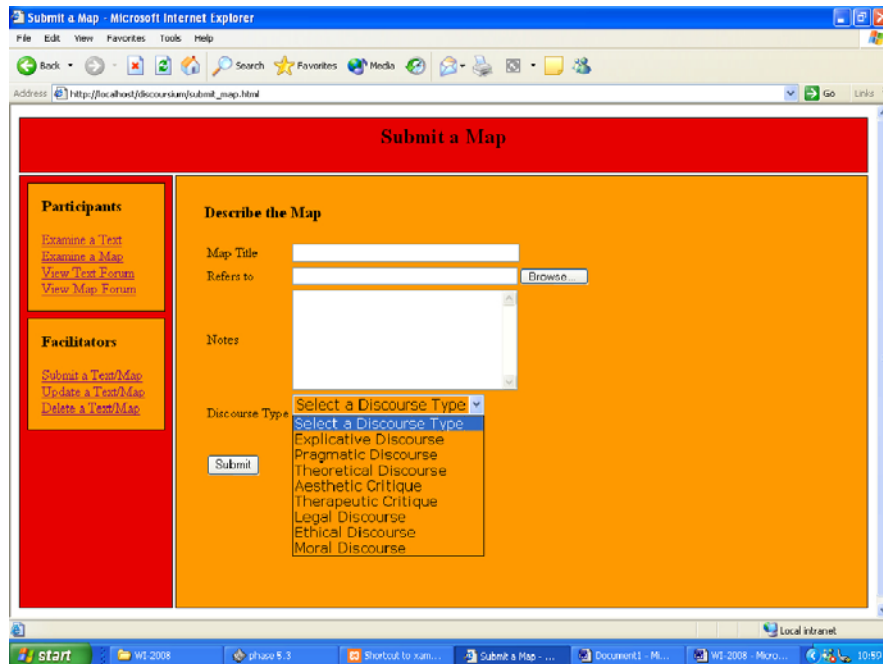


Fig. 2. Screenshot for submitting a map

While examining a text or other objects, the contributions of participants on an issue may be controversial. In DISCOURSIUM, a moderator is responsible for analyzing/summarizing contributions. He or she also identifies controversial positions and creates “argument maps” (or “discourse maps”) containing the controversial positions with associated pro or contra arguments. Currently, DISCOURSIUM does not offer an editor for argu-

ment diagramming. Instead, facilitators can use external tools and techniques for analysis and diagrammatic representation/visualization of arguments (e.g., Kirschner et al. 2003). As shown in Fig. 2, facilitators have to specify each discourse map when submitting it into the system for further examination.

This means that participants do not enter the discourse level (as suggested in the theory) to directly contribute to the arguments of others. Rather, they open a discourse map and use the forum with the repertoire of critical issues to articulate their views/critiques on the map, as shown in Fig. 3. In this way, they indirectly interact with the discourse-level arguments of other participants. In other words, using the same forum to examine both texts and discourse maps relieves participants of having to know what issues/claims to be discussed in which discourses. They just need to learn how to use critical issues in examination dialogs.

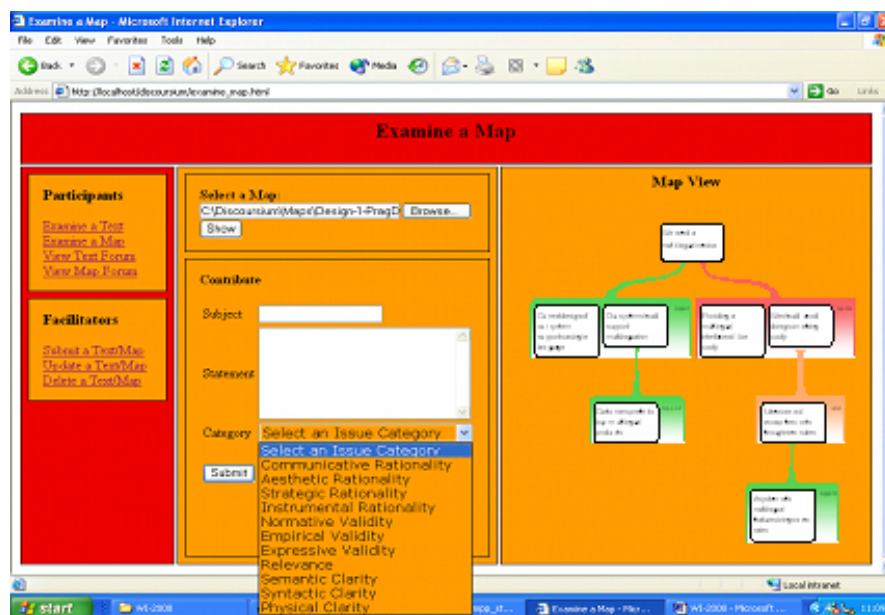


Fig. 3. Screenshot for examining a map

The example map in Fig. 3 is constructed with the Rationale¹ system for illustration purposes (see also Yetim (2007)). Visualized arguments for each discourse can be critically examined or evaluated in different ways. One approach suggests using argumentation schemes from argumentation

¹ Available at: www.austhink.org

theory (Walton 2006), such as argument from expert opinion, argument from example, and using the critical questions associated with each scheme to evaluate arguments. In DISCOURSIUM, the examination issues are used to examine arguments (e.g., expert opinions) without the need to possess knowledge of the argument schemes as discussed and illustrated in (Yetim 2007). In addition, it has been shown that the maps (their form and design) can also be critically examined by using the same categories of issues. In this case, the respondent of the critical questions is/are the moderator(s), who analyzed the discussions and created the maps. In this case moderators are seen in a collaborative examination dialogue with other participants.

3.3 Current State, Evaluation, and Future Research

DISCOURSIUM is a comprehensive socio-technical system, consisting of a mix of people, tools and procedures. We have described the rationale and functionality of the system, which offers a broad spectrum of concepts for reflecting on many issues. The network of different types of discourses allows actors to introduce different types of reasons and to argumentatively examine and justify controversial claims. The development of the system is still proceeding. Hence, the usage of the system has not yet been evaluated and remains a future research issue.

4 GuideMan: A Tool for Managing Usability Guidelines

4.1 Purpose, Scope, and Contribution

GuideMan is a web-based tool for managing usability guidelines. Guidelines present design experiences and support design practice with useful sets of recommendations or prescriptions, and play a significant role in designing (universally) usable systems (Shneiderman 1998; Nielsen 2000). Many guidelines can be used for both design and evaluation of interactive systems. As GuideMan manages design wisdom in terms of guidelines, it can be useful for designers and usability engineers during design and evaluation of interfaces as well as for students interested to learn about and have access to the design experiences. Usually, guidelines are organized either around the media (e.g., text, graphics, video) or around the activities in the context of HCI or processes of information systems development such as planning, design, production, and maintenance. There is a lack of a theoretically well-founded approach to dealing with guidelines.

GuideMan contributes to HCI literature by demonstrating the practicality of a theoretically grounded approach to the management of guidelines. As an IT artifact, it instantiates the categorization framework proposed in (Yetim 2006, 2008b), which uses many concepts from Habermas' works (Habermas 1984, 1996), and additionally considers Toulmin's (1958) model of argumentation. Both theories provide concepts and guidance for the organization and representation of guidelines, particularly in building structures to enable reflections and critiques on guidelines in a systematic way compatible with rational practice. However, the current version of GuideMan focuses on the organization and retrieval of guidelines and does not consider issues of reflections on guidelines. For organizing guidelines, many validity claims from Habermas' works are regarded as usability categories because they deal with aspects of communication and action and cover many usability aspects of user interfaces. They relate to many usability principles ranging from the principle of appropriate presentation of content to its validity and adequacy in relation to users' actions. Hence, the categories represent purposes and specify what requirements system designers need to satisfy, and also make explicit what the guidelines are expected to communicate, namely, recommendations on what should be done to provide readable/perceivable, syntactically and semantically clear signs, to communicate relevant and valid (trustworthy, reliable, appropriate) information, and to act in an efficient and effective way. In addition, the approach uses Toulmin's argument schema to represent further information related to guidelines. For example, it distinguishes between purposes (i.e., the categories), recommendations and justifications as well as other contextual information in a representation schema.

4.2 The Functionality of GuideMan

GuideMan's components support the capturing of and access to a broad range of usability guidelines (Bock and Yetim 2008). Fig. 4 illustrates one of the components, which allows the user to submit new guidelines into the system database. The user is provided with a template for describing the guideline. As mentioned above, the template is based on Toulmin's argument schema and represents knowledge of guidelines in relation to the categories. The knowledge on guidelines includes their justification or rationale (warrant) and supporting evidence (backing) such as empirical research or consensus among experts. In addition, optional information on the degree of strength/importance of the guidelines can indicate whether a content developer *must*, *should* or *can* satisfy the guideline. Finally, optional information about contextual conditions or exceptions (if any) can

be presented to inform the application of guidelines (e.g. specific tasks, systems, groups or cultures).

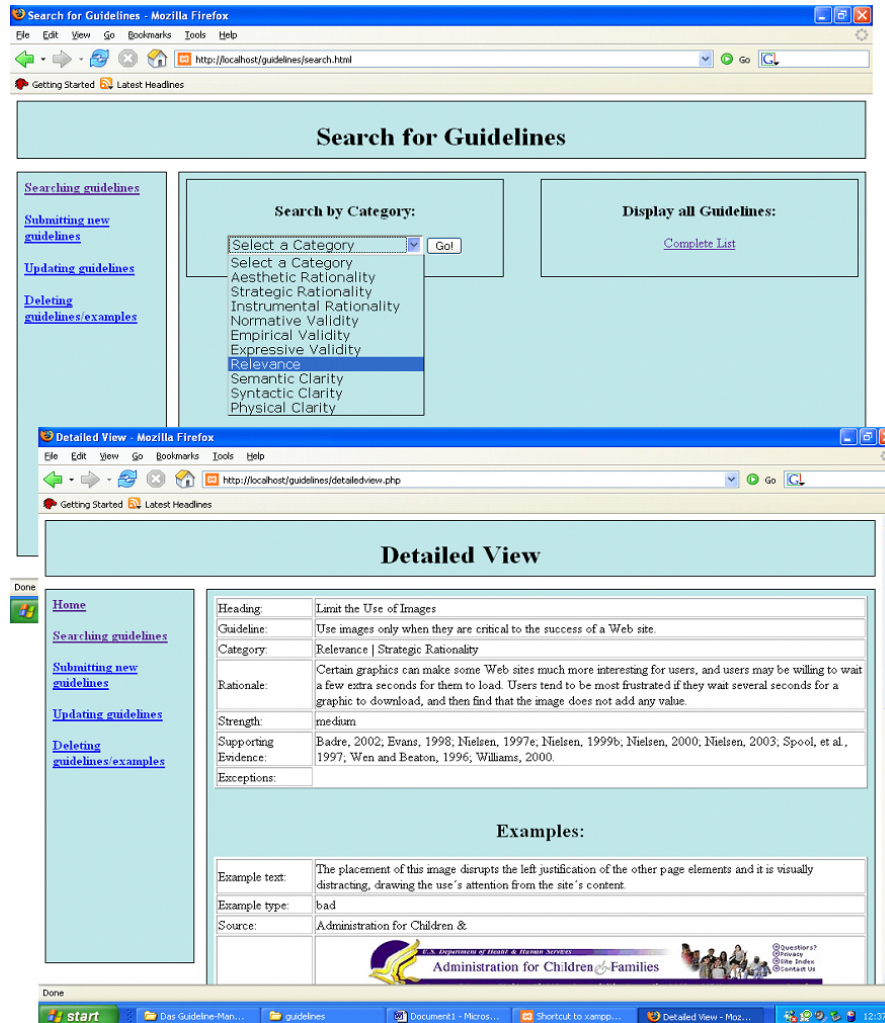


Fig. 4. Screenshots for searching guidelines

Fig. 4 shows the component for searching guidelines, which provides the user with two options: either selecting a category to see associated guidelines, or requesting the complete list. From the list of guidelines presented, the user can request the details for a selected guideline as well as examples related to it.

4.3 Current State, Evaluation, and Future Research

The implemented version of GuideMan focuses on the organization and retrieval of guidelines. So far, we have conducted several studies to evaluate both the categorization model applied in the system and the usability of the implemented system. For the evaluation of the categorization model, two explorative studies were conducted to understand the representational fit of the proposed categories to the domain of guidelines, as described in (Yetim 2009). For these studies, a set of research-based Web design and usability guidelines from (Koyani et al. 2003) is employed. They helped us to understand and enabled us to reflect on the consequences of the proposed model for writing guidelines.

The evaluation of the usability of the implemented system has been conducted by using IBM usability satisfaction questionnaires. A group of students were involved at evaluation tasks. Its aim was to understand usability problems with the system while solving tasks such as submitting, searching, updating and deleting guidelines. The overall results indicate an acceptable level of satisfaction with the usage of the system. Details of the system and its evaluation are provided in (Bock and Yetim 2008).

Future research will explore the application of the discourses from Habermas' theory to allow deliberation on guidelines organized in the system. In other words, it is intended to combine the functionality of GuideMan with that of DISCOURSIUM, in order to allow organization of guidelines as well as to provide categories of issues that can be used to systematically reflect on guidelines while collaboratively assessing them or discussing their applicability in a given context.

5 *JustPro*: A Prototype for Justified Product Recommendations

5.1 Purpose, Scope, and Contribution

JustPro aims to provide product recommendations with justifications. Justification of the system decisions has already been investigated in the context of expert (or intelligent) systems, with the aim of informing users of the underlying reasons why and how the system reaches a particular conclusion or makes a particular recommendation (Yetim 1994). Among the various types of explanations such as trace explanations, justifications, terminological explanations, the justification-type explanations give rise to more positive user perceptions of a system than other explanations (Ye a.

Johnson 1995). User characteristics, and user's level of expertise in particular, have been investigated as influencing explanation use and the type of explanations preferred (Mao a. Benbasat 2000).

Justification of product recommendation can also be delivered with a strategic intention, i.e. for persuading costumers to buy a product. For this purpose, depending on the characteristics (values, attitudes, beliefs) of the customers different type of justificatory knowledge (e.g., economic, ethical or aesthetic ones) can be provided. This is based on the assumption that acceptance of the justification of the recommendation by the customers would have a positive effect on customers' perceptions of the products and that the acceptance of justification itself may also depend on the values and beliefs of the customers. In JustPro, we follow particularly one of the communication design principles, which states that "design should support adaptive behavior, including the contingent use of alternative communication strategies, alternative message forms, and alternative media" (Te'eni 2006, p.67)

From Habermas' works (Habermas 1984, 1996), the set of discourse types are used as orientation to categorize justificatory knowledge for recommendations. As mentioned before, Habermas regards discourse as a reflective form of communication, and differentiates between types of discourses for the argumentative validation and legitimizing of different kinds of knowledge. Thus the discourses provide orientation for the structured management of justifications as proposed earlier in (Yetim 2008). JustPro demonstrates the application of this theory-based categorization of justification knowledge in the context of product recommendations. The system uses the types of justification knowledge for strategic purposes, i.e., it communicates the appropriate justification by considering costumers' values.

5.2 The Functionality of JustPro

JustPro, aiming at providing customer-oriented and justified product recommendations, has two main components to achieve its objectives: (1) the product shopping and (2) the administration components (Fig. 5).

The product shopping component allows customers to specify the type of products. The system then presents the products using the media preferences of the costumer (e.g. text or audio) and also provides a recommendation statement (e.g., "This is the best car for you."). In addition, the system delivers justifications for the recommendation. Currently, the system presents customer-specific justifications only if customer values and rules

exist that legitimize such a choice. Otherwise, all available justifications are presented.

The administration component allows administrators to enter separately (a) product descriptions in different medial form and (b) recommendation statements as well as (c) justifications to be used for many products. In a next step, the administrator can have access to the text base and assign to each product an appropriate recommendation statement and many justifications for the selected recommendation statement. This provides the basis for the system to select the appropriate one in a product presentation time, by considering customer's values. In our prototype, we use a simple model and enter the values manually. More intelligent systems may use other facilities to infer such values from customer's behavior with the system.

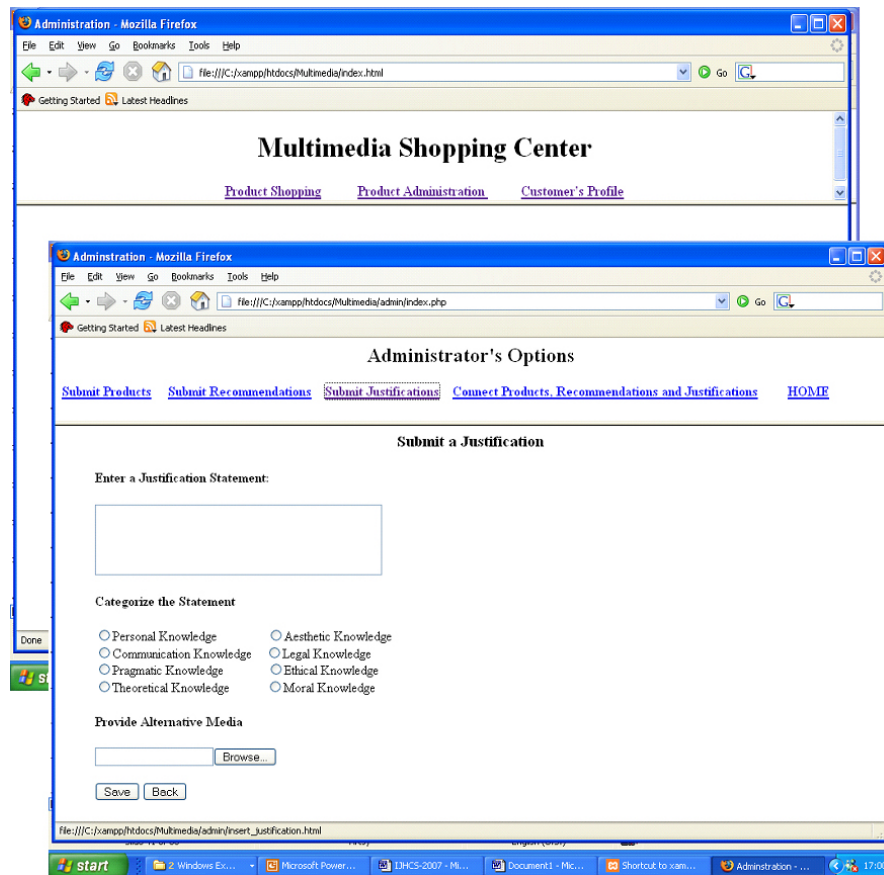


Fig. 5. Screenshots from JustPro

As this paper aims to illustrate the usage of concepts from Habermas' theory, we briefly describe how discourses are used for categorizing justification texts. As shown in Fig. 5, the discourses are renamed as knowledge types for categorizing justifications. A justification statement is categorized as *Personal Knowledge* if it is based on private preferences, beliefs or assumptions of a single person, as *Communication Knowledge* if it deals with knowledge of linguistic or communication rules or signs. *Pragmatic Knowledge* deals with rules expressing purposive-rational choice of means (techniques, strategies), and *Theoretical Knowledge* with scientific theories, laws of nature, mechanistic principles or the like. *Aesthetic Knowledge* is used to categorize those justifications that refer to aesthetic values or interpretations. *Legal Knowledge* deals with justifications that refer to administrative regulations, laws, statutes, and so on. *Ethical Knowledge* refers to justifications that deal with community-specific values ("good" and "bad"), whereas *Moral Knowledge* is concerned with norms that stipulate reciprocal rights and duties (in the form of moral ideals or maxims). Due to limited space, we cannot illustrate them here; a detailed description with illustrative examples can be found in (Yetim 2008).

5.3 Current State, Evaluation, and Future Research

So far, we have described how the different types of discourses from Habermas' theory provided orientation for the segmentation of justification knowledge. The system is still under development, and no evaluation has yet been carried out. It should be mentioned that we have not investigated the relationship between specific values and types of justifications. We assumed their relationships hypothetically and have used simple rules in the current version to simulate the relationships. Future research will address the development of adaptive features of the system and justification of the empirical basis for the relationship between customer's values and the persuasiveness of different types of justification.

6 Conclusions

In this paper, we have shown how several concepts from Habermas' theory of communicative action were translated into practice in three different application domains. From Habermas' works, the concepts of validity claims and discourses have provided orientation in structuring conversa-

tions, usability guidelines or justification knowledge in the artifacts designed.

In the domain of discourse support systems, the concepts are employed for structuring critical examination dialogs. We have also made some compromise design solutions, acknowledging that realistic systems design must take into account some practical challenges. In the domain of usability guidelines, many validity claims are used to organize guidelines and to allow users category-based searching of guidelines. Finally, in the context of product recommendations, the discourse concepts are applied for supporting a theory-driven classification of justifications. In all these applications, there are many open issues remained for further investigation in the future research.

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