Value-Driven Design for "Infosuasive" Web Applications

Davide Bolchini[1,4], Franca Garzotto[2,3], Paolo Paolini[3,4]

(1) University College London Dept. of Computer Science WC1E 6BT London (UK) +44 (0) 20 7679 72 09 d.bolchini@cs.ucl.ac.uk	(2) Politecnico di Milano School of Industrial Design Piazza L. da Vinci 20133 Milano (I) +39 02 23993505 garzotto@elet.polimi.it	(3) Politecnico di Milano Dept. of Electronics and Information Via Ponzio 34/5 20133 Milano (I) +39 02 23993623 paolo.paolini@polimi.it	(4) University of Lugano Faculty of Communication Sciences Via G. Buffi 13 6900 Lugano (CH) +41 (0) 58 6664713

ABSTRACT

An infosuasive web application is mainly intended to be at the same time informative and persuasive, i.e., it aims at supporting knowledge needs and it has also the (declared or not declared) goal of influencing user's opinions, attitudes and behaviors. Most web applications, in fact, are infosuasive (except those whose aim is mainly operational). In this paper, we investigate the complex set of elements that informs the very early design of infosuasive web applications. We propose a conceptual framework aimed at supporting the actors involved in this process to integrate their different viewpoints, to organize the variety of issues that need to be analyzed, to find a direction in the numerous design options, and to represent the results of this activity in an effective way.

Our approach is *value-driven* since it is centered around the concept of *communication value*, regarded as a vehicle to fulfill *communication goals* on specific *communication targets*. We place the analysis of these aspects in the wider context of web requirements analysis, highlighting their relationships with business values analysis and user needs analysis. We pinpoint how values and communication goals impact on various design dimensions of infosuasive web application - contents, information architecture, interaction, operations, and lay-out. Our approach is multidisciplinary, and was inspired to goal-based and value-based requirements engineering (often used in web engineering), to brand design (often used in marketing), and to value-centered design "frameworks" (as proposed by the HCI community). A case study exemplifies our methodological proposal, discussing a large project in which we are currently involved.

Categories and Subject Descriptors

H5.4 [Hypertext/Hypermedia]; H.1.0 [Information Systems]: models and principles – general. D.2.1 [Requirements/Specifications].

General Terms

Web Design, Human Factors.

Keywords

Web engineering, web design, communication goals, requirements, value, value-driven design, brand, persuasive design, globalization, conceptual model.

1. INTRODUCTION

The web has already made its transition from an information to a communication medium. It has become one of the main vehicles for commercial and non commercial "entities" to reach the global society and to establish or promote their "brand" in the global economy [30][34]. Through the web, companies, educational or cultural institutions, charities, governmental bodies, politicians, artists, and many other subjects, offer services, inform and communicate and interact with their stakeholders, build and maintain a relationship with them and among them, and attempt to influence their attitudes and behavior. The goal of many modern web applications is at the same time *informative* – i.e., to support knowledge needs, *operational* – i.e., to support operational needs such as buy or sell or make reservations, *social* – to connect people, and *persuasive* – i.e., to change user's opinions, attitudes and behaviors [22].

This trend has progressively increased the complexity of the design space and introduced a number of novel issues that imply a rethinking of our current design approaches. In particular, in this paper, we focus on systems whose main goals are *info*rmative and per*suasive*, calling them *infosuasive* web applications. We address the *very early* design stage of infosuasive applications, when concepts are initially formulated vaguely, are somewhat unfocused and inaccurate, and must be progressively organized and refined to become more precise design solutions. This phase of the development process must give voice to a variety of actors, being them application stakeholders or members of the design team. This is due to the multi-facet nature (informative and persuasive) of the system development, and to the fact that the contexts in which the web application must be "placed" is potentially more complex to frame. Whereas in the past, web applications were conceived for a known business and social context, such a "clear-cut" context is oftentimes lacking today [13]. In the global society, many, mutually influencing issues have to be understood and decided on during the very early design process, which include cultural, social, psychological and ethical dimensions (beside strategic, marketing, and technological aspects that were normally taken into account in the past). As a consequence, this activity requires more and more an *interdisciplinary* approach involving competences in web engineering, interface design, marketing, branding, ethnography, communication science (and perhaps others).

The main contribution of this paper is to propose a *conceptual framework* for infosuasive web applications, that supports the members of the design team (strategic decision makers, marketers, business managers, brand designers, communication designers, graphic designers, information architects, technology experts) to share their thoughts, to integrate their different viewpoints, to

organize the variety of issues that need to be analyzed, to find a direction in the numerous design options, and to finally represent the results of this activity in an effective way.

Our approach is *value-driven* since it is centered around the concept of *value*, regarded as a means to achieve given *communication goals* on specific *communication targets*. We place the analysis of these aspects in the wider context of web requirements engineering, highlighting their relationships with business and techno-organizational analysis and user needs analysis. We then pinpoint how values and communication goals impact on various design dimensions of infosuasive web application - contents, information architecture, interaction, operations, and lay-out. Our work was inspired to goal-based and value-based requirements engineering, brand design methods, and value-centered design "frameworks" (as proposed by the HCI community).

In the rest of this paper, we review the related work (section 2), discussing how the concept of value is exploited for design purposes in different web related disciplines. Then we discuss our value-driven approach for the design of infosuasive web applications, providing a general overview (section 3) and introducing the case study (section 4) that will help us to exemplify the various concepts of our conceptual model, depicted in section 5. Section 6 draws the conclusions and pinpoints the future research directions.

2. VALUE AND WEB DESIGN: AN OVERVIEW

The term "value" is broad, and it is outside the purpose of this paper to discuss the moral, philosophical, psychological or economical foundations of this concepts (the reader is referred to [16] for an overview.). Our less ambitious goal in this section is to review some design approaches in HCI, e-commerce, requirements engineering, web engineering, e-branding, in which the notion of value has been explored.

Values sensitive design (VSD) [15] [16] emerged in the mid '90s in the HCI community as an approach to the design of information and computer systems that accounts for human values in a principled and comprehensive manner early and throughout the whole design process. Value sensitive design particularly emphasizes values with moral import, including privacy, trust, respect for intellectual property rights, freedom from bias, moral responsibility, honesty, democracy. Many works in VSD exemplify how different aspects of web design can account for such values. Rather than a "methodology" in engineering sense, VSD is intended as a "framework for understanding" [16] how specific values play out in the overall design process, and how these values can be undermined or promoted by the technology, thus shaping (but not rigidly determining) individual and social behavior.

Value centered design (VCD) [11] shifts the focus from "value as human belief" (as promoted by VSD) to "value as worth", that is, whatever some people somewhere find worthwhile, individually or collectively, irrespective of ethics, wisdom, style, taste, etiquette or the approval of others. Values are regarded as a *motivator* for investing time, money, energy, or commitment in the development or use of a web product or service by all (direct or indirect) stakeholders. This approach is still in its infancy, and the proposed VDC "process" is still quite general. It basically suggests to iteratively *identify* and *evaluate* the benefits (either economical, or emotional, or affective) gained by the end user (either as an individual or as a collectivity) by effect of the

experience with the system under design. As stated by its inventors, "much needs to be done to move from a set of arguments and a plausible development framework to proven approaches"[11].

The VSD concept of "technology as value promoter" has been integrated in a broader design approach known as *persuasive design* [14]*,* which focuses on how to design technological artifacts that change attitudes and behaviours. The reference book on this subject [14] provides a number of general persuasion guidelines; it also exemplifies how they are used in existing web applications, e.g., to foster reliance, credibility and trust, or to instill some human values in web users (such as environmental attention), or to induce specific habit changes in users' life.

Emotional design [27] investigates how emotions during a product's experience can create value for the user (e.g., pleasure, fun, calmness, trust), which in turn results into a value for the product developer. Although the vision of emotional design covers any, physical or virtual, design object, web artifacts are one of the main domains for this approach, and [27] reports many impressive examples of the seductive, *persuasive* power of creating emotions through proper web design solutions.

The notion of value for persuasion purposes also plays a key role in *brand design,* also named *e-branding* [21] when applied to the web. The notion of "brand" is perhaps as broad and general as the concept of value. Etymologically, brand just means "identification mark or sign" (e.g., a textual or symbolic visual sign given to a product or service or company). Still, its meaning in the design practice is much more abstract: the brand of an "entity" - being it a product, a service, a company, an institution, a person or, at a broader level, a country or a culture – is "who I am, what I believe, why you should trust me" [6]. It is a *promise of value* [6] that the entity can keep to all its stakeholders - customers, trades, stockholders, employees, fans, or supporters. The web has strengthened and expanded the economic relevance of branding concepts not only for e-institutions (i.e., those existing only on the web, e.g., Amazon) but for any commercial and non commercial entity that wants to establish or promote their "brand image" in the global society. The web has also fostered a rapid evolution of brand design basic principles, creating new opportunities of brand expression and offering new means to shape the "promise of values" that are relevant to user's expectations and desires [25].

Most of the existing publications in the above fields is stimulating but tends either to be overly abstract, or to solve the different issues through an anecdotic style of investigation. They lack a conceptual or procedural framework that might guide a designer and make an approach easily re-usable. Above all, they do not provide any systematic guidance to reflect the different high-level value issues onto the dimensions of the design space.

Value based design (VBD) [4], a recent approach emerged in requirements engineering and in web engineering, is more pragmatic and systematic. It looks at the notion of "value as worth" from a strictly business perspective, i.e., in terms of the economic benefit that is induced by a system and makes the company or institution more competitive and profitable. Recently, VBD was applied to the design of e-commerce systems.

The e^3 value model [18][19][20], for example, provides a conceptual framework for representing and analyzing business models for e-commerce, in terms of a network of actors and enterprises creating, distributing, and consuming things of economic value through the web. e^3 value represents the economic interest of various stakeholders from multiple perspectives: the

business value viewpoint, the *business process* viewpoint and the *software architecture* viewpoint. e^3 value modeling techniques can be combined with *goal-based requirements modeling* (using *i** [35]) to support designers in creating, representing, and analysing business models and stakeholders goals for e-services in a more comprehensive way [18]. [33] integrates high level business value requirements specified in e^3 value to lower level detailed design using WebML+, a formal extension to an existing web modeling language (WebML [10]). For a similar purpose, the VIP model [5] provides a UML based modeling framework that integrates e^3 value constructs with WebML.

In a previous publication [9], we discussed the rationale for taking into account branding issues in the web design process, and propose *brand values* as first order citizens in a web requirements modeling framework – named AWARE+ [9]. AWARE+ extended a previous requirements model - AWARE (Analysis of Web Application Requirements [7]) – that exploited a goal-oriented RE approach specifically for web applications. AWARE balanced the consideration of users' needs and other stakeholders' goals; these are operationalized into application requirements through refinement and decomposition processes, whose output is fed into a subsequent design activity. An original feature of the method is the use of a hypermedia *design taxonomy* to categorize requirements and to facilitate the organization of the design activity [8]. Based on the experience gained in a very large web project in e-tourism [24], we built AWARE+ [9], which focused on content-intensive web applications with the purpose of bridging high level *communication requirements* with web design concepts. We intensively used and tested AWARE+ in number of successive projects involving large design teams. From such experience we built a new, substantially revised version of the framework, which is presented in this paper.

The current version captures our deeper understanding of the communication and persuasion power of the web and how communication and persuasion elements play with other factors in the very early design process of infosuasive web applications. With respect to the previous version, the main novelty of the new release of AWARE+ relies upon the definition of *infosuasive* web application; the introduction of *communication analysis* in requirements management; the adoption of "*values*" as modeling primitives for communication and persuasion purposes; and the definition of clear relationships among values, communication goals and communication targets.

3. OUR APPROACH AT A GLANCE

In the definition of the requirements space for infosuasive web applications, each of the many actors in a design team - strategic decision makers, marketers, persons responsible for business process development, brand designers, communication designers, graphic designers, information architects, technology managers - contributes with a different perspective, grounded in differences in skills, responsibilities, knowledge and expertise, and culture in a broad sense. The requirements analysis is to be carried on from different viewpoints; each of them is initially self-contained, encapsulates partial, high level knowledge about the problem domain and the relevant stakeholders, and is typically specified in a particular, suitable representation language. The results of the various viewpoints eventually need then to be combined to inform lower level design decisions. Traditionally, three main viewpoints are considered.

Business analysis addresses the problem from an economical perspective using for example a model like e^3 value. This activity is directly related to the institution's strategic vision, sets the *business goals* and *constraints* of the application, defines the expected *value (in commercial terms)* for the various stakeholders, and defines the characteristics of the business model.

Techno-Organizational analysis [3][13][32] investigates the context in which the web application is built and conceived. It explores all the elements that, together, define the "culture", the structure, and the dynamics of an organization: the organizational rules and constraints; the organization "tradition"; the schemas, norms, and routines together with associated activities and resources; the relationships between the organization and its social, political, institutional, and economic environments.

End-user analysis identifies various aspects, including: the *information* and *operational needs* of end users; the context in which the application is intended to be used; the motivations for using the application, as well as user *values* as desired *qualities of the interaction* (e.g., usability, security, accessibility). These elements can be elicited through user research (ethnographic techniques, questionnaires, interviews, focus groups, or participatory design methods [26][23]) and can be further elaborated using scenarios, task analysis, goal-based RE approaches [7][12][35], or similar conceptual tools.

The persuasive dimension of infosuasive applications introduces the need for a fourth form of analysis, which we refer as *communication analysis*. This activity, which is crucial for infosuasive applications, is the focus of our approach (Figure 1). Figure 1 pinpoints the key modeling concepts of communication analysis - *communication target, key value, brand value*. It highlights the *relationships* among such elements and the requirement space that defines the functional and non functional characteristics of a web application, in terms of content, information architecture, lay-out, operational and socialization services, and other non functional aspects (e.g., security, usability, and similar). Whereas figure 1 summarizes the conceptual elements, in practice the communication analysis adopts *matrixes* and *tables* to document the output of the different communication analysis tasks. As shown in the various examples in section 5, a tabular notation is very agile and readable especially to support elicitation and brainstorming with the stakeholders.

Communication analysis involves the elicitation of specific aspects but also leverages upon the knowledge information that is generated from the other forms of analysis. Figure 1 shows the information that business, organizational, and end user analysis *exports* towards communication analysis (hiding the details on how such knowledge is elicited and modeled). It also pinpoints that requirements of different nature are informed by the knowledge produced by *all* forms of analysis: the same design property of an application can be motivated at the same time by a business, informative, operational or organizational goal, *and from key values and brand values resulting from communication analysis*. The novelty of our approach is to identify the role of communication analysis in the overall requirements process, and to elaborate the key elements that participate in this activity. Before discussing the above concepts more precisely, we will briefly describe a case study that will be used to exemplify our approach.
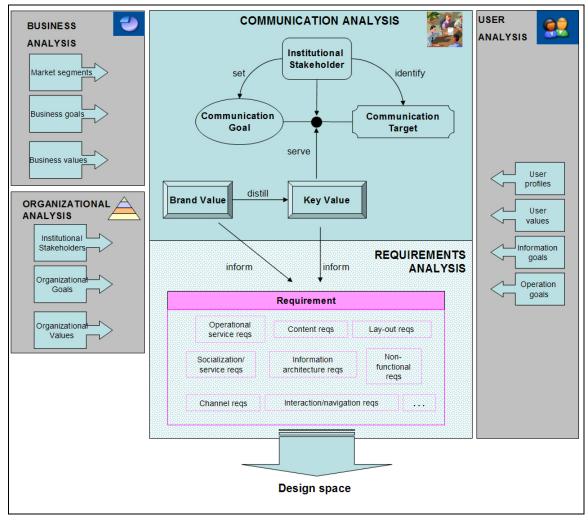
Figure 1: At a glance: AWARE+ for "infosuasive" applications.

4. THE CASE STUDY

In January 2007, the University of Lugano (hereinafter USI – Universita' della Svizzera Italiana) commissioned to the authors the redesign of the communication and technological web infrastructure of the whole university. Particularly, the project involved the complete rethinking and redesign of fifty websites related to the University of Lugano (one official university website and one website for each of the four faculties, plus a variable number of websites of laboratories, institutes, projects, and university services). The motivation for this project was driven by a number of factors, including the "aged" look&feel of the websites (designed four years earlier), the clumsy information architecture resulting from continuous micro-changes occurred over the years, technological considerations (need of technology update), content quality issues (no proper workflow for quality control was in place), and other contingent organizational reasons.

The new version of AWARE+ has been applied to the early-stage of requirements analysis and design of the main university website and of the faculty websites, and will be used as well for the other new websites to be developed within the context of the project. The project directly involved various representative stakeholders (the USI President, the Administrative Director, faculty representatives, faculty members, service representatives,

and the communication and media office) and user representatives (students).

5. AWARE+ PRIMITIVES

5.1 Communication Target

Communication analysis starts from the consideration of the *profiles of the communication targets*, i.e., the persons or institutions the web communication action is directed to. The definition of target profiles is directly related to the client strategic vision, is under the direct responsibility of top level institutional stakeholders, and is partially informed by the output of business analysis. Still, it is based on communication criteria and not on strictly marketing considerations, and does not necessarily coincide with the definition of market segments [23]. Whereas the overall purpose of the market segmentation and targeting is to identify groups of similar (existing or potential) "customers", the intent of the user segmentation based on communication purposes aims at capturing all relevant external stakeholders who may be of interest for the communication action, even if not necessarily being potential customers.

5.1.1 Example

For the USI website, the primary communication targets have been elicited in the discussion with the top level *institutional stakeholders*: *the President, the General Secretary and the Promotion Office Representatives*. The sixteen *communication targets* are reported in Table 1 and conveniently grouped into "Internal students", "Prospect students" and "Others".

Table 1: Communication Targets for USI website

COMMUNICATION TARGETS	
Internal students	Bachelor, Master, PhD, Alumni
Prospect Students	Bachelor, Master, PhD
Others	Students' Families, Funding Agencies, Canton, Confederation, Other Universities, Outside researchers, Outside colleagues, Prospect Partners. Local Media, National/International Media

Each target represents a group of people the University would like to engage and maintain a successful dialogue with through the website in order to achieve its communication goals, as discussed next.

5.2 Communication Goals

Communication goals define the persuasion purposes, i.e., the effects that must be achieved on the users in terms of adoption or change of ideas, attitudes, behaviors, i.e., what Pierce called a "habit change" [29]. Defining the communication goals is a critical activity, which allows hidden or non explicit objectives to surface in a clear and very distinct fashion. As for communication targets, also the definition of communication goals is directly related to the client strategic vision, and is under the responsibility of the institutional stakeholders. Communication goals are *not* the business goals specified by the business analysis, but may act as a vehicle to achieve one or more business goals, and should be consistent with them.

By their own nature, communication goals *are directed to* specific targets, and must be differentiated according to the different target profiles [28]. One of the key principles of communication and persuasion, which the web channel can support better than traditional media, is "tailoring": a persuasion action is more effective if it is personalized, i.e., tailored to the target profile, in order to build a customized relationship between the message receiver and the message sender [2][27].

5.2.1 Example

The USI stakeholders needed to elaborate the overall purpose of the communication towards each different communication target. As shown in Table 2, the diversification of the communication goals for the different targets is quite rich.

The guiding questions to elicit such goals in our project have included the following: "How does the university want to be perceived?" (see goals for the Prospect students, Students' Families, the Canton and the Confederation); "What actions or behaviors can users undertake that can be beneficial for the university"? (see for examples the goals for internal bachelor students).

5.3 Key Values

Key values are captured as a way to operationalize communication goals into more pregnant "messages" and "perceptions" that need to get across to each communication target. As discussed in section 2, values are very diverse in nature, but they may emerge from a common line of reasoning,

stimulated by the question: *What does the entity promise to be to each communication target?*

Table 2: Communication Goals for USI website

COMMUNICATION TARGET		USI COMMUNICATION GOALS (attitudes or behavior to induce on the different targets)
Internal students		
	Bachelor	Feel satisfied as members of a community; Act as a "word of mouth" recruiters; Feel encouraged to pursue their studies with specialization curricula (masters).
	Master	Feel satisfied as members of a community; Act as a "word of mouth" recruiters; Feel encouraged to remain in touch with USI after the completion of their studies.
	PhD	Feel satisfied as members of a community; Act as a "word of mouth" recruiters; Feel encouraged to remain connection points toward USI from their future positions.
	Alumni	Feel encouraged to keep in touch Help for recruiting new students, for setting up internships, for corporate and institutional relationship, for "word of mouth" branding
Prospect Students		
	Bachelor	Feel that USI as an attractive place to come for studies
	Master	Feel that USI as an attractive place to come for studies
	PhD	Feel that USI as an attractive place to come for studies
Students' Families		Feel that USI as a safe and constructive place to come for studies
Funding Agencies		Believe that USI provides a key contribution to the growth of the Swiss scientific arena as a place for research excellence.
Canton		Believe that USI as one of the key players for the growth of the "Ticino scientifico".
Confederation		Believe that USI is a key academic bridge to Italy. Believe that USI is an added value in the Swiss universities panorama because it represents the Italian part of the Confederation which rose to the academic level.

A key value can be a moral, ethical, social, or cultural *belief* which an entity is committed to. Environmental sustainability, for example, is a value in this sense. Values of this nature are important for persuasion purposes since people tend to identify themselves more easily with entities that share with them some common fundamental beliefs.

As well known to social psychologists and brand designers, when an entity plays to our values about ourselves and the society, we experience it positively [27]; value sharing is a trigger for human connection and enforces the rational or emotional relationship between the message sender and the receiver.

A key value can be *a quality of an entity* (being it a product, a service, a company, an institution, a person or, at a broader level, a country or a culture) that is worthwhile for people, either at individual or collective level. This quality is not necessarily functional, but can be something that gives rise to positive emotional or affective effects [1][17].

For example, "excellence in teaching" is a value (intended as functional quality) that can be associated to a university (see USI example below). "Eco-chic" or "exclusive" can be a value (intended as emotional quality) associated to a tourism resort.

The definition of key values is a complex process, which requires a deep understanding of multiple factors, including the social, psychological, cultural characteristics of the communication targets; their attitudes, desires, trends, beliefs. It also entails an understanding of the characteristics of the physical and organizational context is which their experience will take place (in order to build a promise that can be fulfilled), as well as attitudes,

desires, beliefs of institutional stakeholders. Thus the definition of key values may leverage upon the knowledge resulting from communication analysis as well as all the other analysis activities, as shown in figure 1. On one hand, key values may reflect the organizational values of an institution. They may be conceived in view of the achievement of one or more communication goals for given targets. It is likely that a market repositioning or a change of business goals will reflect into a change in the key values definition. On the other hand, key values should match the desired or expected values of end users, which may result from user analysis, as suggested by value-centered design approaches (see section 2). Key values should be therefore ideally elicited involving both end users and institutional stakeholders.

The process of key values definition is not a simple one, because it involves strategic thinking, realism, and, at the same time, an immediate perception of the communication effectiveness to be achieved. To stay on track during key value elaboration with the institutional stakeholders, these persons need to be constantly reminded that key values are not only abstract principles but they should be functional to the achievement of the stated communication goals. In order to shape the key values for each user segments, the strategic thinking involved here consists in selecting those traits of the entity "personality" which are a value for a target, so that a communication action can leverage on them to achieve its persuasion objectives.

5.3.1 Example

As a practical technique, for the definition of key values in our project we gently "forced" stakeholders to stick to not more than 3 or 4 for communication target. The risk was to have a long list of values so that the communication could lose focus and thus effectiveness.

Table 3. Key values for each communication target

COMMUNICATION TARGET	Key Value 1	Key Value 2	Key Value 3	Key Value 4
Internal students				
Bachelor	Identify with USI as global entity	Friendly and familiar	We are transparent	
Master	Identify with USI as global entity	Awareness of the USI community	We support your career	
PhD	Identify with USI as global entity	Awareness of the USI community	We support your growth	
Alumni	Identify with USI as global entity	We are changing	We need your help: get involved	
Prospect Students				
Bachelor	Quality of education	Humanized, familiar (good relations with teachers)	Effective, innovative	Safe environment
Master	We focus: well specialized curricula	International, multilingual	Top quality teachers	
PhD	We focus on specific high level areas	Well connected to other institutions	Efficient organization	
Funding Agencies	Excellence of research	Well connected	Very young, multidisciplinary	
Canton	Competitive research (at international level but also responding to national or local research mandates)	High quality education	Well connected to local institutions	
Confederation	Strong internationalization (Faculties and Students)	Academic bridge to Italy. USI as Italian-speaking part of the Swiss academia.	Young and modern	Agile and effective governance
Other Universities	Competitive research	Up to international standard	Well connected in Switzerland and international	
Outside researchers	Competitive research	Well connected	Excellent and familiar environment	
Outside colleagues	Competitive research	Well connected	Excellent and familiar environment	
Prospect Partners	Excellent of research	Efficient	Agile and well organized	
Local Media	USI is a center of culture	USI is well connected to local institutions	Innovative	
National/International Media	Very active	Excellence of research	Innovative	

This simple constraint on the number of key values implied a considerable effort during the negotiation with the various stakeholders and among the design team. However, it turned out

that the same fact of reasoning towards specific niches of targets and communication goals, instead of referring to the "generic" brand of the university, already helped a lot the team in shaping clear, sound, and agreed key values.

For example, in order to induce internal bachelor students to act as "word of mouth" recruiters", we needed to make them feel part of USI as a whole (beyond the boundaries of their specific class or course programme), and to foster the perception that USI is a familiar and friendly environment. Values such as "sense of belonging" and "human sized context" were recognized as functional to specific communication goals and were therefore included among key values.

5.4 Brand Values

Key values should be consistent and aligned with the general (pre-existing) brand values elaborated by the institutional/corporate communication and marketing experts. For example, USI had general brand values such as "*international, innovative, interdisciplinary*".

The brand values – typically elaborated by brand experts – represent the "core message", the "priority values" that more than any other value define the identity and the personality of an entity. They contribute to the definition of the "brand image" - the set of beliefs, emotions, attitudes, or qualities that people immediately associates to an entity in their mind when they think of that entity. Brand values are those with the highest potential of hitting a conscious or unconscious level, and of remaining as long lasting imprinting that endures after the real or digital experience with the entity itself. Brand values are the elements that will be reified, during design, into the few visual constructs (symbolic or textual such as logo or "motto") through which an entity will be identifiable under different conditions and "you will recognize it as yours" [2].

To understand the relationship between key values and brand values, it is important to note that:

- Key values are more tactical (relevant for the contingent project at issue), brand values are more strategic and long-term. In other words, brand values are more "stable": if a change of business goals may easily induce a modification in key values, a change of brand identity values must reflect a more radical and profound transformation of the whole entity.

- Key values can be addressed and elaborated by web engineers; brand values are typically the results of the work of brand, communication and marketing experts.

- Brand values are less directed towards a specific target, but should be appropriate for almost all of them.

- Brand values may not be defined and elaborated through elicitation: if an entity has already a well identifiable "brand", they are already explicit.

Overall, brand values must be pervasively and persistently communicated across the entire application, while different key values may be addressed in different portions of the application, devoted to specific targets and communication goals.

5.5 Requirements

How do the elements discussed so far impact onto lower level design decisions?

To smoothly support the transition between communication analysis and application design, requirements are identified and

classified according to a *hypermedia design taxonomy*, that defines the *design "dimensions"* on which the various communication analysis elements may have an impact (see figure 1). These design dimensions reflect a conventional classification of design features as defined in most existing web design models [9][10][31].

Content requirements indicate the characteristics of the core information elements to include in the application. This category of requirements may have multiple sources: content needed to support operational tasks (such as "finding course information"); content necessary for informative reasons or institutional constraints (e.g. University regulation); "strategic" content descending from communication analysis and based on specific brand assets. This is the content which should have a communication impact (e.g. convincing about the excellence in research) on the user in the light of the communication messages expressed by key values.

Information architecture requirements define the characteristics of the overall structure of the content (including access criteria, navigation paths topology, hierarchical position of the different content elements, etc.).

Interaction and navigation requirements specify navigation patterns (such as "index" or "guided tour"), interaction paradigms (e.g., "menu based") or communication formats (e.g., "storytelling").

Layout requirements refer to the application presentation, i.e., to the visual and "look&feel" properties of the web interface, including chromatic style, elements allocation on the screen, visual priority and affordance, logo characteristics, etc. Brand values have typically a strong impact on this dimension.

Operational services requirements correspond to conventional functional requirements on the operations performed by the application or made available to the user to achieve his or her operational goals.

Socialization services requirements are a special type of operational requirements that address the social dimension of the web, defining the characteristics of services devoted to "connect people" and perform social task.

According to our model (see again figure 1), requirements are also considered as to their *relevance* to the *delivery channel* (e.g., stationary PC, PDA, mobile phone, web TV, etc.) by which the user can experience a given message or use a service[1].

In principle, the output of communication analysis informs all the above types of requirements, since any characteristics of an application may be exploited, in principle, to transmit or enforce a given "message" (brand values and key values). For lack of space, in the rest of this subsection we will focus only on content and layout requirements, discussing how content and layout features can be shaped in relationship to communication analysis.

5.5.1 Informing Content Requirements

Content is usually defined in terms of a set of typed or non typed multimedia "content units". These may be built on the basis of the input of business, techno-organizational or user analysis (see again figure 1). Indications for shaping the content can come from

---

[1] We notice that the output of communication analysis can also inform the content requirements for non web channel, either physical or digital, such as newspaper or TV advertising, flyers, events, which are the "traditional" scope of brand communication.

goals and values of different user profiles, from values and goals for different market segments, or from organizational goals and values of different components of the organization (the latter elements determine, for example, which content must be published for legal or organizational constraints). Another potential source for fruitfully brainstorming about content requirements (not shown in figure 1) is benchmarking analysis or pattern analysis, which provides a comparative description of the content design solutions of other similar entities (e.g., university websites, in USI case study). This set of content units (see a snapshot of it in the rows of Table 4) represents a preliminary set of coarse grain content pieces, at different level of abstraction, for the application under design.

We then *cross content units with key values and communication targets* to highlight the persuasion semantics of the different content units (their "message").

The resulting representation requires, in principle, a 3D matrix, but in practice a combination of two 2D matrices is more lightweight and readable, as shown in Tables 4 and 5. Coding key values (e.g. 1, 2, 3 …) may help make reference to them in other documentation contexts and bring them over onto the further steps of the design process.

Crossing content units with key values independently from the targets (Table 4), and analyzing them from different perspectives, highlight a number of content requirements issues that are crucial for guiding the design process:

- *Analysis by rows.* A row indicates which key values should be communicated through a given content unit. For example, the content unit about the university "Campus" can lend itself to be effectively used as a "persuasion moment" to convince the user about the key values "Friendly and familiar, safe environment" (key value 2) and "We are changing / we are evolving / we are active" (key value 6)

- *Analysis by columns.* A column indicates which content units can we leverage upon to communicate a given key value. For example, column 3 indicates that key value 3 -"we are transparent" (i.e. a transparent institution at many levels, from internal procedures to communication) should be supported though content units "organization", "mission statement", "statistics". In other words, these content units should convey the message aimed at persuading users about the "transparency" of the university at various levels.

Table 4. Crossing key values with content units in USI

No	Content unit	1	2	3	4	5	6
		Key Values					
1	Welcome	x	x				x
2	About the university						
3	Organisation	x		x			
4	Mission statement			x	x	x	
5	Statistics			x			
6	The University and the city ["The city name"]		x				
7	Campus		x				x

Crossing content units and key-values is useful also for checking the *consistency* and *completeness* of contents with respect the overall set of high level goals.

If a content unit is not related to at least one key value, it means that it is not functional to persuasion purposes. Still, it may be useful for the fulfillment of other goals. If no other reasons for its existence are found, it is likely to be removed. Similarly, it is

highly desirable that each key value finds a place in the content to enact its persuasive power. If no content unit is found for a key value, it may be advisable to brainstorm about a new content unit to add; alternatively, it may be discussed whether that key value can be communicated through other requirements (e.g. graphics or layout), or instead dropped out from the key values list. To use a biological metaphor, the content here acts like a "growth medium" for a key value, i.e., it is what provides the nutrients necessary to the growth of and enactment of key values. Being it through a compelling text, engaging pictures, audio or videos, key values can be mainly exploited through the communication of content.

Finally, the specification of a consistent set of value-referenced content units represents a very powerful tool for supporting and coordinating *content authors* (who are typically spread across an organization and need to work in a distributed, but collaborative fashion) in the *creation of the actual content.* For example the person who is responsible for writing the text relative to a specific information unit, e.g. the campus, can be guided by the indication that she must convey the message "friendly and familiar, safe environment". The person who is in charge of selecting the proper images for the same subject, should try to express values such as "We are changing / we are evolving / we are active" (key value 6). In the "campus" page in figure 2, for example, an image showing a shining modern architecture building has been chosen for the above purpose.

In USI project, using the Content Units → Key-Values matrix we build a simple value-driven authoring tool. It is based on a set of structured "sheets", with each sheet - one per content unit – indicates the key values that should be "played" in the text argumentation and in the images associated to that unit.

The matching Content Units → Key-Values represents the expected persuasive impact that the stakeholders would like to get through the content, and is complemented by the matrix Content Units → Communication Target, which represents content requirements with respect to the expectations of different communication targets. A snapshot of this matrix for USI case study is shown in Table 5.

Table 5. Crossing content units with communication targets

No	Content unit	Description	All targets	Prospect students			Funding agencies
				Bac	Master	PhD	
1	Welcome	General presentation of the institution; the president's welcome.	xxx				
2	About the university	Profile, historical landmarks	xxx				
3	Organisation	Description of the way the institution is run, administrative bodies, governance					xxx
4	Mission statement	Mission, vision, goals in research and education.		X	x	x	
5	Statistics	Statistical data					x
6	The	Placing the institution		X			

Again, we gain different insights when elaborating and reading the matrix along the different dimensions. An analysis *by rows* pinpoints who is potentially interested in a given content unit. An analysis *by columns* pinpoints which content units are useful (for any purpose) to a given communication target. Through activities of user analysis such as interviews and focus groups, we can enrich this representation, e.g., filling each intersection with a quantitative indicator of relevance.

By iteratively filling in the matrix and reasoning on it among analysts and stakeholders about the decisions made, it becomes evident which content is an important focus of the application, since it serves a large number of communication targets. Blank rows should raise questions about the relevance of a given content unit ("why should it be put in?"); blank columns should alert about the fact that we are failing to reach a given communication target (e.g. what are we offering to the "local media"?).

The association of content types to user targets is a common activity in user-centered design. In our approach, its role is mainly to support the *validation* the content requirements and communication analysis. In addition, it supports the bridge between communication requirements and *information architectures* requirements. For example, following the indications of the matrix, we can shape specific navigational access paths organized "by communication target group".

As shown in Figure 2 (left side pop up menu), in USI we designed various groups of content units, each one specifically relevant for a given communication target (prospective students, current students, faculty and staff, etc.); these groups are aggregated into the section "For you", which is directly accessible from any page.

5.5.2. Informing Layout Requirements

Brand values inform many lay-out requirements, concerning the characteristics of all symbolic constructs - logo, pay-off, slogan, mottos, colors – that define the entity visual identity [2], and how they map onto the different pages. In most cases, visual identity elements pre-exist in some form and must be simply adopted and consistently used in the lay-out definition in order to enforce the "corporate coordinated image" [6].

As previously mentioned, lay-out requirements deriving from brand values are pervasive across the entire application. In USI project, the university pay-off ("International, Interdisciplinary, Innovative") is constantly present in all pages (see Figure 2), a requirements dictated by the brand identity of the university, as discussed in section 5.4.

Similarly, the logotype (which is the institutional one) and the choices of the chromatic codes is a legacy of the brand values.

Other requirements concerning the layout find their rationale in key values and in communication targets. Even if graphic designers normally hate working within a framed methodological guidance, these elements are typically at a level of abstraction that also strongly creative persons can accept, using them as guidelines for sketching their layout proposals. As it is visible from the page design proposal in Figure 2, all the overall layout profile was conceived to express the USI qualities "very young", "agile", "scientific excellence", "modern", "transparent", "at pace with times".
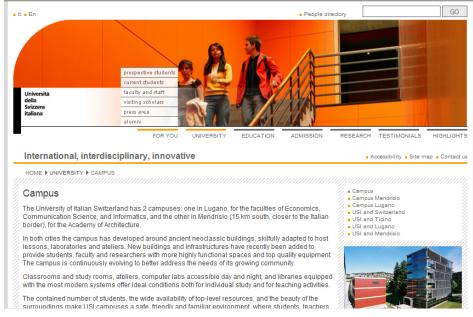
Figure 2. A content page prototype for the new USI website.

The choice of the thematic picture on top of the pages, which is different for each section, is for example guided by the need of evoking specific key values for a specific target. In Figure 2, a page of the section for "Prospect Students", the top image should suggest the feeling of a "Friendly and familiar" USI, and of a "friendly environment".

It is interesting to notice how the adoption of a value driven approach has induced some organizational changes that are functional to make the value driven design project more efficient. For example, the whole USI database of institutional digital pictures was polished, reorganized, and enriched with new material, in order to support the visual design activity, to serve other content authoring tasks discussed in section 5.5.1, and to be more aligned with the communication needs indicated by the key values.

6. CONCLUSIONS AND FUTURE WORK

The framework presented in this paper provides three novel contributions. Firstly, it proposes the category *infosuasive* as characterizing those websites (the greatest majority) that at the same time provide a large amount of information and try to persuade the user about something. Secondly, it expands the notion of goals, as usually intended by requirement engineering community, to include *communication goals*, i.e. goals characterizing the wished "impact" on the user. Finally, it proposes *communication values* as a way to clearly express, in a concise manner, "what is the message" (possibly tailored to different users and concerning different part of the website).

In addition to the above basic contributions the framework has a number of interesting features:

- it provides *usable operational tools* (as the different matrixes) to carry on the requirement analysis;
- it provides *guidelines about how to take into account communication requirements for the different parts of design*, such as, for example, content design, layout design, and info-architecture design;
- it is also *lightweight* in two senses: it does not require much effort to adopt it and it does not require much effort to teach it to someone;

- it is a wonderful tool *to build consensus in a complex community of stakeholders* (as it can be found for a University website); the communication goals and values are so readable, in fact, that even the less expert stakeholders can understand them, express their opinion about them, and possibly accept them. Once communication goals and values are accepted, the design effort becomes much less arbitrary.

As far as future work is concerned, several are our current directions, but we only mention the most relevant ones.
Communication Impact evaluation: since we have set up precise communication goals, and we have transformed them into communication values, we are in the position to actually evaluate whether the wished impact is achieved or not. We can do this for different design components: e.g. does the content of this page convey the message(s)? Does the layout of this page convey the message(s)? Does the info-architecture of this part of the web site convey the message(s)? We are expanding current usability evaluation methods to include the analysis of the communication impact.
Methodology transfer to industry: is the framework effective and lightweight enough, that it can be easily adopted by practitioners in web development? We think that methodology-transfer is key item in the research agenda for any new methodological proposal. We are current discussing with a few industry representatives in Italy, in order to teach them the method and to assist them into adoption.
Finally, a longer term research effort aims at defining more precise and detailed guidelines for guiding design (in all its aspects) taking into account communication goals and values.

7. REFERENCES
[1] Alben L. "Quality of Experience" Interactions, 13 (5), ACM Press, May-June 1996. pp. 12-15.

[2] Andres C., Fishel C., Matson Kapp P. "Identity Design Source Book", Rock Port Publisher, 2004.

[3] Anderson R. I., Crakow J., Joichi J. "Improving the design of business and interactive system concepts in a digital business consultancy". Proc. DIS0, Designing Interactive Systems:

processes, practices, methods, and techniques, London (UK), June 2002, ACM Press pp. 213-223.

[4] Aurum A, Wohlin C . "A Value-Based Approach in Requirements Engineering: Explaining Some of the Fundamental Concepts", in Proc. REFSQ 2007 (Int. Working Conf. on RE: Foundations of Sofwtare Quality), Springer-Verlag 2007.

[5] Azam F., Li Z., Ahmad R. "Integrating Value-based Requirement Engineering Models to WebML using VIP Business Modeling Framework". Proc.WWW07, Banff (Canada), May 2007, pp. 933-942.

[6] Bassani M, Sbalchiero M, "Brand Design". Alinea, 2002.

[7] Bolchini, D., Paolini, P., "Goal-Driven Requirements Analysis for Hypermedia-intensive Web Applications", Requirements Engineering Journal, Springer, RE'03 Special Issue (9) 2004, pp. 85-103.

[8] Bolchini D., Paolini P. "Interaction Dialogue Model: A Design Technique for Multichannel Applications". IEEE Trans. on Multimedia, 8 (3), June 2006.

[9] Bolchini, D., Garzotto F., Paolini, P., "Branding and Communication Goals for Content Intensive Interactive Applications". Proc. Int. Requirements Engineering Conference RE'07, New Delhi (India), Oct. 2007, IEEE Press.

[10] Ceri S., Fraternali P. Bongio A., Brambilla M., Comai S., Matera M. "Designing Data-Intensive Web Applications", Morgan-Kaufmann, 2002.

[11] Cockton G. " A Development Framework for Value-Centered Design". Proc. CHI'03 – Portland (USA), April 2003, pp. 1292-1295.

[12] Dardenne A, van Lamsweerde A and Fickas S. "Goal-Directed Requirements Acquisition". Science of Computer Programming 1993; 20 (1): 3-50.

[13] David M. W. "Co-design, China, and the commercialization of the mobile user interface". Interactions, 13 (5), ACM Press, Sept. 2006. pp. 36-41.

[14] Fogg B.J. "Persuasive Technology", Morgan Kaufmann, 2003.

[15] Friedman, B., Kahn, P. H., Jr., Howe, D. C. Trust online. Communications of the ACM, 43(12), 2000, pp. 34-40.

[16] Friedman, B., & Kahn, P. H., Jr."Human values, ethics, and design". In J. A. Jacko and A. Sears (Eds.). "The human-computer interaction handbook", Lawrence Erlbaum Associates, 2003.

[17] Gobé M. "Emotional Branding". Allworth Press ed., 2001

[18] Gordijn J., Yu E., Raadt B., „E-Service Design Using i* and e3value Modeling". IEEE Software, Vol. 23(3):26-33, May 2006.

[19] Gordijn J., Tan Y.. A Design Methodology for Modeling Trustworthy Value Webs. In International Journal of Electronic Commerce, Vol. 9(3):31–48, M.E. Sharpe, Armonk, NY, 2005.

[20] Gordijn J., Akkermans H.. Value based requirements engineering: Exploring innovative e-commerce idea. In Requirements Engineering Journal, Vol. 8(2):114-134, 2003.

[21] Gerstman R. (eds.) "Branding@thedigitalage", Palgrave, 2001.

[22] Holtzblatt K. "Designing for the Mobile Device: Experiences, Challenges, and Methods". Communications of the ACM, 48 (7), ACM Press, July 2005, pp.33-35.

[23] Kuniavsky, M., Observing the User Experience. A Practitioner's Guide to User Research, 2003, Morgan Kaufman: San Francisco.

[24] MAPS "Final Report" - Marketing Activities for the Promotion of Syrian Cultural Heritage, Ministry of Tourism/Directorate of Museum and Antiquities - Syrian Arab Republic, EU Cultural Tourism Development Program, 01/2005 EC 119756 EUROP-AID.

[25] Marcus A. "Branding 101", Interactions, 11 (5), ACM Press, Sept. 2004, pp.14-21.

[26] Muller M.J., Kuhn S. (eds.) Comm. ACM – Special Issue on Participatory Design. CAM 36:6, June 1993.

[27] Norman D.A. "Emotional Design". Basic Books ed., 2004.

[28] Park S., Harada A., Igarashi H. "Influences of Product Preferences on Product Usability", Proc. CHI'06, Montreal, Quebec (Caada), April 2006, ACM Press, pp.87-92.

[29] Peirce, Ch.S., A Survey of Pragmaticism. 1907.

[30] Pine B.J., Gilmore J. H.. "The Experience Economy: Work Is Theater & Every Business a Stage", Harvard Business School Press, Boston (MA), 1999.

[31] Rossi, G., Pastor, O., Schwabe, D., Olsina, L., Web Engineering: Modelling and Implementing Web Applications (Human-Computer Interaction Series), Springer, 2007.

[32] Scott, R. (1992). Organizations: Rational, Natural, and Open Systems. Englewood, NJ: Prentice-Hall.

[33] Tongrungrojana R., Lowe D., "WebML+: a Web modeling language for forming a bridge between business modeling and information modeling", in Proc.SEKE03 15th Int. Conf. on Software Engineering & Knowledge Engineering, San Francisco (USA), July 2003, pp. 17-24

[34] Wheeler A., "Brand Identity: A Complete Guide to Creating, Building, and Maintaining Strong Brands", Wiley, 2006.

[35] E. Yu, "Towards Modelling and Reasoning Support for Early-Phase Requirements Engineering," Proc. 3rd IEEE Int'l Symp. Requirements Eng. (RE 97), IEEE CS Press, 1997.