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A DESIGN RESEARCH STUDY ON ENHANCING CREATIVITY – THE CASE OF DEVELOPING PRODUCT-SERVICE BUNDLES

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Abstract

As the sole production of goods is more and more becoming a commodity, many manufactures start bundling their physical products with related value-added services in order to differentiate their value propositions. The process of developing such customer-oriented combinations of products and services is an innovation process that requires the input of creative individuals. In this design-oriented paper we describe the conceptual design and prototypical implementation of an IT system that supports creative individuals performing such creative development efforts. The conceptual design builds on the provision of explicit knowledge by means of multi-perspective, hierarchical navigation structures. We argue that this concept (a) fosters information access that accords with the creative nature of a product development process and (b) furthering creative thinking through the provision of three distinct types of stimuli that actuates new entry points in a person's cognitive network. The conceptual design of the system has its underpinnings in associative theories on creativity.

Keywords: Creativity Support, Product-Service Bundles, Information Retrieval, Navigation Hierarchies

1 INTRODUCTION AND RESEARCH DESIGN

Over the last decades, in most developed countries we have been witnessing a transition from a primarily goods-based to an increasingly service-based economy (Vargo & Lusch 2008). One explanation for the growing importance of services is the observation, that the sole production of physical goods is more and more becoming a commodity which can be almost equally provided by a constantly growing number of companies around the world (Rai & Sambamurthy 2006). At the same time, services are advancing as increasingly differentiated value propositions that are thought to lead to higher levels of customer satisfaction and loyalty (Howells 2003). Consequently, many traditional manufacturing companies try bundling their products with related value-added services to offer integrated customer solutions. Examples of such product-service bundles can be found in the automotive (e.g. automobile plus insurance, maintenance, trade-in, etc.) or telecommunication (e.g. mobile phone plus calling plan, messaging, music downloads, etc.) industry, but also in B2B markets like the machine tools industry (machine tool plus transport, integration, start-up, training, operating personnel, etc.).

The development of innovative product-service bundles comprises the discovery of prospective combinations of products and services. This innovation process can be characterized as a creative act. Creativity is the process of generating valuable products, services, processes, or ideas that are both novel and useful (DeGraff & Lawrence 2002, May 1959). This process results in innovations that are thought to effectively address a specific purpose in order to prosper (Amabile 1998). Against this background, product-service bundles can be characterized as innovations. A bundle's value proposition must be new in order to stand out from competitors and it has to meet customer expectations or stimulate new demands. Accordingly, frameworks and models for product and service engineering (Scheuning & M. 1989) put creative acts like brainstorming or idea generation at the very beginning of a development process.

In order to support such creative processes, particularly two types of IT systems must be considered. First, research on so-called creativity support systems (CSS) has examined how computer systems can positively influence creativity (Massetti 1996). CSS implement different creativity techniques in order to provide guidance through the idea generating process (Malaga 2000). Second, theories on creativity identify a person's knowledge as one major antecedent to the ability of being creative (Amabile 1998, Weisberg 1999). Knowledge management systems aid the creative process as they store organizational knowledge and support the creative individual in information retrieval (Shneiderman 2000). Yet, to our knowledge, there have been few efforts on integrating knowledge management and creativity support systems.

The purpose of this paper is to address the question of how to construct an IT system, which supports *both* creative thinking and information retrieval in the development process of a product-service bundle. The designed artefacts resulting from this design research process are a model and an instantiation (March & Smith 1995). We develop a model that explains how multi-perspective, hierarchical navigation structures can be applied to access digital information repositories in order to appropriately support creative persons in their effort of developing product-service bundles. Since models "that work 'on paper' will not necessarily work in real world contexts" (March & Smith 1995), we also present a prototype which is meant to serve as an evaluation object in a subsequent step of our research agenda demonstrating the feasibility of the proposed model. Our design rational is based on a theoretical underpinning from literature and theory. The design of the prototypical implementation incorporates results from an empirical study we conducted in the field of product-service bundle development. The focus of our research in its current state is to rather derive a sound design based on the existing body of knowledge in the IS field than to empirically validate the artefacts. However, our implementation is meant to provide the basis of consecutive evaluation steps.

The remainder of this paper is structured as follows: In the subsequent section we introduce a theoretical model that describes the conceptual basis of an IT system supporting the creative

development process of product-service bundles. To do so, we gradually develop the facets of our model from literature and theory (section 2). This is followed by the description of a prototypical implementation (section 3). In doing so, we exhibit the graphical user interface which reflects how the different aspects of the conceptual model expand into the prototype (section 3.1). Since hierarchical navigation structures play a prominent role in our approach, we subsequently apply the results of a survey on classification schema for product-service bundles to derive the navigation structures for the domain in focus (section 3.2). For the reason of presenting our design proposal in a more tangible manner, we present an example illustrating the intended value of our artifacts (section 3.3). The paper concludes with a discussion of contributions and limitations and an outlook to our future research agenda (section 4).

2 THEORETICAL MODEL

Creativity in an organizational context can be analysed on various levels. Woodman, Sawyer, and Griffin (1993) consider three levels of analysis: the individual, the group, and the organizational levels. Their model provides a comprehensive account on factors that impact creativity on these different levels and the interrelations that exist between them. The present study focuses creativity on an individual level. The theoretical model is meant to conceptualize how an IT system may aid a creative individual in solving her creative task.

Creative tasks are characterized by a high demand for flexibility and result in both deliverables and process orchestrations that are hard to predict and control in advance (Seidel & Adams & ter Hofstede & Rosemann 2007). For instance, the structure of the development process and the information needed are different whether a mobile phone is combined with a lifetime insurance against theft (e.g., gather relevant legal formalities, undertake risk assessment) compared to developing a bundle that valorises a mobile phone by providing a subscription for a music download service (e.g., contract negotiations with music labels, develop technical infrastructure). Thus, creative persons need a high level of autonomy in utilizing and controlling instruments they apply. We further argue that an approach towards creativity support must address several aspects of creative work. Our argument rests in the literature that identifies three primary components of creativity: motivation, expertise, and creative-thinking skills (Amabile 1998). While motivation is crucial to become creative at all, the way people approach problems and solutions (creative-thinking skills) and their knowledge about the domain of their work (expertise) also fundamentally contribute to the quality of a creative task's output (Amabile 1998). Existing knowledge is a critical factor in the creative process; being creative often means "to put existing ideas together in new combinations" (Amabile 1998). For example, running shoes (product) that transfer one's exercise performance online to a physician who analyses the data and elaborates a personal training schedule (service) constitute a highly creative product-service bundle. However, its parts are well-known. Thus, creative work comprises of both the convergent process of identifying relevant, existing 'things' (Weisberg 1999) and the divergent process of fusing these in novel ways (Seidel & Rosemann & Becker 2008b); "for a creative person to produce socially useful products, his or her divergent thinking must come hand in hand with convergent thinking" (Woodman et al. 1993, p. 299). IT systems may support this processes by providing its users additional expertise and furthering their creative-thinking skills.

In the remainder of this chapter we introduce an approach that aids both facets of creative work simultaneously: it provides explicit knowledge to support convergent thinking in a way that allows for the particular features of creative tasks and it provides means to foster ones creative-thinking skills in order to advance divergent thinking processes (Seidel & Müller-Wienbergen & Rosemann & Becker 2008a).

Throughout this work we rely on the assumption that knowledge positively correlates with the creative capacity of an individual. Although this is strongly supported by literature, there is literature which claims that existing knowledge can actually be a hindrance for creativity and innovation. The main aspect is often seen in the danger of biasing creative people by providing knowledge and thus limiting

their imagination (Cheung & Chau & Au 2008, Levitt & March 1988). This is the reason why we argue in favour of a *combined* provision of existing knowledge and means for stimulating creative thinking to prevent individuals from merely running down well-known alleys. Carlile and Rebentisch (2003) take in a critical stance regarding the suitability of knowledge reuse in complex and novel situations. They argue, that if the circumstances surrounding the original knowledge development have changed, the knowledge is no longer relevant and its reuse can even be problematic. However, in creative problem solving situations the mere adoption of existing solutions never is an option. To be creative such a solution has to be novel by definition. Thus, reusing existing knowledge in creative tasks always involves its transfer into the new problem context. Carlile (2002) exposes that knowledge proves both a barrier to and a source of innovation in new product development. Its negative impact comes into effect when different communities of practice participate in an innovation process since boundaries between them hinder effective communication and cooperation. However, these boundaries neither exist within a single community of practice nor do they bear relevance for the individual level, which is the focus of the present study. Against this reasoning, we stick with Amabile (1998) by claiming that existing knowledge can fuel the creative process.

A database that provides a diverse set of information related to products and services establishes the basis of our approach. Such a database can broaden the expertise of persons involved in the development process of product-service bundles. For instance, checking the feasibility of a product-service combination often requires expert knowledge related to technical specifications of the product or legal formalities on the provision of services in individual countries. As the central concept of our model, we propose multi-perspective navigation structures as a means of accessing such digital information items. We argue that this approach to information retrieval is in favour of the convergent aspect of creative problem solving. First, hierarchical navigation structures support a creative problem solver with the explication of her information needs: Due to its creative nature, requirements for a product-service bundle are often rather vague. Thus, people involved in this creative process are often not capable of stating explicit search queries. Hierarchies can serve as an intuitive representation for the notions of abstraction and aggregation (Furnas & Zacks 1994). They can lead individuals along a stepwise refinement process in order to satisfy their information needs (Brelage 2006). Second, multiple navigation hierarchies that represent diverse perspectives on digital information provide access to the database by different users in different problem solving situations. The explicit knowledge that is considered relevant by a person as well as how this knowledge is accessed depends on both a person's worldview and the specific situation's context (Mey 1982, Polanyi 1975). Thus, information retrieval is about aligning the cognitive structures of a system's users, its designers, and the information providers (Ingwersen 1992). Consequently, we argue that a single hierarchy is not sufficient to serve the often very heterogeneous (Markus & Majchrzak & Gasser 2002) group of possible information seekers (Furnas & Zacks 1994). Third, multi-perspective navigation means can provide a powerful device to expressing restrictions on the result set of an information retrieval process. As multiple hierarchical navigation structures classify the assigned items from different perspectives they may be applied to formulate multi-dimensional, set-theoretic constraints. In a system that provides the functionality of browsing the different navigation structures simultaneously, the user may refine constraints interactively. Such a dynamic approach of expressing information needs is in favour of the highly vital process of identifying relevant knowledge in creative problem solving situations. A similar approach is known from the area of business intelligence, namely the concept of online analytical processing (OLAP) (Pendse & Creeth 1995) which is applied to navigate through comprehensive sets of structured data.

In addition to providing appropriate means for the convergent aspect of creative work, we suggest to also aid the divergent facet of the development process for product-service bundles, so as to support a user's creative-thinking skills. Associative theories explain the theoretical underpinning of our approach (Runco 2007). Mednick (1962) detected that truly creative ideas originate from remote associations within an person's cognitive network. Likewise, Santanen and Briggs and de Vreede (2000) suggested that creativity is a function of the distance between the areas of an individual's cognitive network that have been activated and combined to form a solution. According to Taylor

(1975), the areas of a cognitive network – mental states as he refers to them – are linked and via these connections the different mental states tend to activate each other provoking new ideas. The more remote the activated states are the more likely is the generation of a creative idea. In this context the concept of associative hierarchies becomes relevant. Such hierarchies denote the strength and organization of a person's cognitive associations (Mednick 1962). Individuals with steep associative hierarchies tend to be less creative than people with rather flat associative hierarchies. For the former, it is harder to leave the very strong connections between their mental states and recall the more remote associations (Malaga 2000). Thus, an approach to supporting a person's creative-thinking skills has to provide stimuli to break up inflexible associative hierarchies and to activate more remote mental states that otherwise will not be reachable via an individual's associative connections.

Based on the above discussion, we propose an information retrieval system that is accessible via multi-perspective hierarchical navigation structures in order to provide stimuli. At this, a stimulus is not meant to provide immediate value by explicating a concrete example of re-arranging existing things and thus constituting a creative idea itself. It rather fuels the creative process of experimentation and exploration by activating a new entry point into a creative persons cognitive network to initiate the process of going beyond the already known. The path this cognitive process takes is definitely outside the scope of an IT system. We argue that such a system is suitable to provide three primary types of stimuli (cf. Table 1). In the following we describe the different types in detail.

Stimulus pattern	Stimulus source	Intended creativity impact
Intra-perspective stimulus	Navigation structure	Hierarchies provide a multi-level, disjoint categorization of database items. Starting from a category in focus, they give a glance at the range of possible alternatives at the current level of abstraction. These alternative options may serve as stimuli, as the user may not have considered all of them.
Inter-perspective stimulus	Navigation structure	Alternative navigation hierarchies represent alternative perspectives on the same facts. The explication of these diverse world-views may provoke new cognitive associations.
Content stimulus	Database content	Digital artefacts contained in an information repository exist in various formats addressing different senses. Various representation styles activate different creativity potentials and may in conjunction even better the recall of mental associations.

Table 1: Stimulus patterns

Intra-perspective stimulus

A navigation hierarchy can indicate alternatives that a creative person has not considered before. It represents a stepwise, disjunct categorization of the digital items contained in an information repository. All the navigation nodes on a selected hierarchy level that a system's user does not choose along her navigation path to a specific item of interest may reveal alternative options, which lay outside her associative hierarchies. In becoming creative "everything is raw material." (Coutu 2008) We refer to this stimulus pattern as *intra-perspective stimulus*.

Inter-perspective stimulus

"Within the mind of an individual, diversity enhances creativity." (Amabile & Khaire 2008) The existence of multiple navigation hierarchies may motivate a system's user to consider a different perspective onto the problem at hand. If a single repository item is accessible via discriminative navigation hierarchies, these hierarchies represent different classification schemas. Every schema may be understood as a different perspective on a repository's content. Thus, the diverse navigation structures not only serve users with discriminative world-views as an appropriate means to access information items; the explication of these different world-views may also stimulate a user of such navigation hierarchies so as to consider different perspectives on her creative task. This way she is

empowered to identify additional entry points into her cognitive network. This stimulus pattern we call *inter-perspective stimulus*.

Content stimulus

Apart from the navigation structures, the information items themselves can serve the purpose of providing stimuli to a user. Digital artefacts contained in an information repository as sketched above exist in various formats. Such different formats address different human senses. According to the dual coding theory (Paivio & Lambert 1981) human memory and cognition are served by two separate symbolic systems which are interconnected but also capable of functioning independently. One system handles verbal information and the other system processes non-verbal information. Due to the linkage between both systems, representations in one system can evoke associations to representations in the other system. For instance, a picture can be named, and images may leap into someone's mind while reading a specific word (Malaga 2000). Experiments evidence that using lexical and pictorial stimuli simultaneously amend one's ability to recall an association from memory (Paivio 1983). Furthermore, the separation between both systems implies that naming a concept and visualising the same concept can stimulate different associations and thus provokes different 'creative' ideas. Moreover, different individuals have different abilities in verbal and visual problem solving strategies (Malaga 2000). Hence, different content formats activate different potentials in becoming creative. Against this background, providing an ample set of contents in various formats and styles proves reasonable in order to stimulate divergent thinking. These types of stimulus we refer to as *content stimulus*.

3 PRACTICAL INSTANTIATION

3.1 Graphical User Interface

Part of our research is the development of a prototypical instantiation that is ought to both proof the theoretical model's feasibility and serve as a tool for evaluation (Hevner & March & Park & Sudha 2004). As this research aims at designing an IT system that supports human creative performance, we rather focus our descriptions on user interface than dwelling on internal data structures and algorithmic issues. Thus, in the following we describe the graphical user interface and illustrate how the different conceptual aspects of the above introduced model were implemented. The theoretically informed model imposes several requirements on the user interface:

1) It has to present hierarchical navigation structures.
2) It must support the user in browsing several hierarchies in parallel.
3) Alternative navigation nodes have to be visible on every hierarchy level in order to provide intra-perspective stimuli.
4) Alternative navigation hierarchies on a database item or navigation node have to be evident so as to serve as inter-perspective stimuli.
5) Various content formats have to be pictured simultaneously catering for different user preferences.

We decided to not use classical tree structures as known from browsing file systems for the following reasons. First, presenting a deep and broad hierarchy in a tree structure consumes much space on screen. Especially if several hierarchies are presented simultaneously, this approach is not feasible. Second, navigating along a tree structure by dynamically expanding and collapsing branches results in constantly changing positions of the nodes and, thus, in a very restive navigation experience. Therefore, we apply a navigational concept, which is to some extend leaned on the approach of collapsible cylindrical trees as proposed by Dachselt & Ebert (2001). Child nodes in a hierarchy are mapped onto rotating, three-dimensional cylinders while the path to the currently focused navigation node is illustrated by means of a list above each cylinder (requirement 1) (cf. Figure 1). This approach exhibits several advantages: The width of every hierarchy illustration is constant which results in an easy segmentation and good utilization of the available screen space. Because hierarchies grow to the

bottom, several navigation structures may be placed side by side on one screen (requirement 2). Moreover, the appearance of the navigation structures is more static and thus easier to comprehend and less strenuous to use.

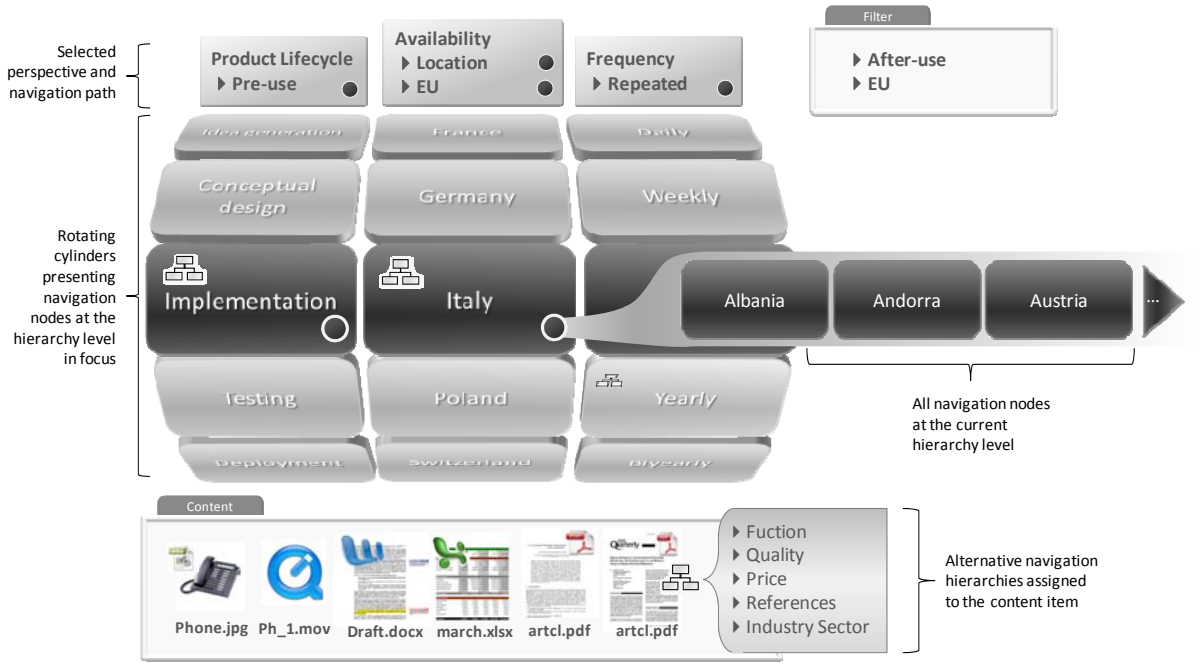

Figure 1: Conceptual design of graphical user interface

Although rotating cylinders intuitively display hierarchy levels of variable breadth on a screen area of constant size, they lack the ability to show all elements of a hierarchy level at the same time. Hence, they fall short of providing intra-perspective stimuli. In order to overcome this shortcoming, we implement the ability to expand a cylinder or path element to show all available alternatives at a corresponding hierarchy level (requirement 3). As a means to implement what we referred to as the inter-perspective stimulus, the interface highlights every content item or navigation node that is related to a navigation hierarchy different from the one in focus with a small badge. This badge expands to list all related navigation hierarchies, which may be chosen in order to change the navigation 'perspective' (requirement 4).

In order to select relevant content items from the database, the user can select multiple navigation nodes from different navigation hierarchies to work as a filter. The current filter expression is shown on the right of the navigation cylinders, while the related content items reside in the bottom area of the screen. The database items are represented by previews of their content and, thus, provide an immediate content stimulus (requirement 5). Furthermore, the system can retrieve remotely related content for every database item that is arranged around the item in focus, in order to function as another source of content stimuli. An algorithm determines the contents' relatedness independently of the navigation structure but calls on content-based similarity metrics (Knackstedt & Kuropka & Müller & Polyvyanyy 2008).

3.2 Navigation Hierarchies

As indicated, we suggest hierarchical navigation structures as a device in order to stimulate creative thinking and to further information retrieval. To do so, such structures must provide means of information access that fit to the context they are applied in. In order to illustrate this, in the following we present the results of a survey on classification schema for product-service bundles that provides an empirical basis on which appropriate navigation structures for this particular domain could be developed. The underlying, highly iterative process of data collection was conducted as follows.

Perspective	Description	Empirical relevance	Standard deviation
Quality	Quality properties (e.g. reliability, credibility) of the service	1.59	0.925
Personnel	Qualification, experience and competences of provider personnel	1.70	0.898
Availability	Availability in terms of time (e.g. 24 hours, 7 days a week) and location (e.g. only in Germany)	1.73	1.025
Price	Price per unit of measurement (e.g. per use, per time period, flat)	1.74	0.942
Function	Goal or purpose of the service	1.76	0.949
Rights & duties	General rights and duties of the provider and consumer (e.g. confidentiality)	1.79	0.990
References	References to past projects or customers	1.79	0.944
Utility	Utility for the consumer (e.g. sales increase, cost cutting)	1.85	1.105
Resources	Resources (e.g. tools, information) employed by the provider during service provisioning	1.86	1.040
Ratings & rankings	Independent benchmarks or official certifications of the provider	1.87	1.040
Service process	Sequence of activities executed during service provisioning	1.92	1.100
Terms & conditions	Definition of contractual obligations (e.g. regarding payment or delivery)	1.95	1.144
Product lifecycle	Reference to the lifecycle stage of the related physical product	1.98	1.013
Industry sector	Industry sector for which the service is provided	1.98	1.123
Customer input	Which resources (e.g. objects, information, personnel) has the customer to provide during the service provisioning process	1.99	1.098
Frequency	Units and time intervals of service provisioning	2.02	1.158
Contract duration	Duration of the service contract (e.g. one-time, subscription)	2.17	1.270

Table 2: Empirical relevance of perspectives on product-related services

First, we conducted a broad review of the literature in order to identify perspectives for which navigation hierarchies could be identified. We concentrated our efforts on literature on conceptual models, ontologies, and standards of the services domain. The considered work covers both, a primarily business-oriented view (e.g., Baida 2006, DIN 2002) an d a more technology-oriented view (e.g., Oaks & ter Hofstede & Edmond 2003, W3C 2004, W3C 2005) of the domain. We identified 37 initial perspectives (Knackstedt et al. 2008), which we consolidated into 17 central perspectives (cf. Table 2).

In a second step, over a period of six weeks in summer 2008 we conducted a telephone-aided questionnaire-based survey in the German mechanical and electrical engineering industry in order to empirically validate the relevance of the identified perspectives. Sales and marketing managers, responsible for cross-selling product-related services together with their core physical products, from 200 different companies (only one interviewee per company) participated in the study. The sample is nationally representative in terms of company size (number of employees), product technology, and industry subsectors. The participants were asked to rate the relevance (on a 5-point Likert scale from 1 (very relevant) to 5 (not relevant at all)) of the 17 consolidated perspectives when describing product-related services to their customers. All perspectives were attested in terms of relevance (cf. Table 2),

with quality (1.59), personnel (1.70), availability (1.73), price (1.74), and function (1.76) being the five most relevant.

In a third step, having validated the empirical relevance of the consolidated perspectives, we identified concrete navigation hierarchies for each perspective. In doing so, we relied on existing classification schemas (e.g. taxonomies) where possible. Table 3 lists an exemplary selection of such available classification schemas. For some perspectives several schemas could be easily identified. For example, the North American Product Classification Schema (NAPCS), the United Nations Standard Products and Services Code (UNSPSC), and the eCl@ass standard are promising candidates for a navigation hierarchy concerning the 'function' perspective. Likewise, there are numerous published lifecycle models that can be applied for navigating through the 'product lifecycle' perspective. Appropriate hierarchies for other perspectives, e.g. 'quality' or 'price', are dependent on the product or service at hand and have to be custom-made.

Perspective	Publicly available classification schema	Excerpt from the content
Quality	SERVQUAL	Reliability/Assurance/Tangibles …
Availability (locative)	ISO-Norm 3166	EU → DE → NW
Function	North American Product Classification System (NAPCS)	Services → Telecommunications → Messaging services
Resources	Classification of Resources (Seppänen & Mäkinen 2007)	Resource → Legal → Copyrights
Service process	MIT Process Handbook	Make → Make-to-order → Manufacture and test
Terms & conditions	INCOTERMS	Group C (Main Carriage Paid) → CIF (Cost, Insurance, and Freight)
Product lifecycle	VDI-Norm 2884	Before utilisation → Realisation → Procurement
Industry sector	North American Industry Classification System (NAICS)	52 Finance & Insurance → 5222 Non-depository credit intermediation → 52221 Credit card issuing
Customer input	Classification of Resources	Resource → Legal → Copyrights

Legend: x/y: x and y are on the same hierarchy level; x→y: y is a sub-category of x

Table 3: Examples for publicly available classification schemas

In the following section we illustrate the application of these classification schemas to form the proposed multi-perspective, hierarchical navigation structures.

3.3 Example Case

We now demonstrate the presented creativity support approach using an example case. The portfolio manager of a global provider of enterprise communication solutions wants to develop a novel product-service bundle. The company so far only offers installation services when selling a telephone system. Browsing to installation services in an IT system realizing the presented approach, the portfolio manager notices that installation is classified as a 'pre-use' service in the 'product lifecycle' hierarchy. She realizes that there also is a 'use' and 'after-use' lifecycle stage (intra-perspective stimulus). She selects the 'after-use' stage and a collection of related documents appears on her screen. Since the result set contains more than thousand items, she sets a further filter by selecting 'EU' within the 'availability' hierarchy. Within the shrinked set of documents, she picks a newspaper article that is about the latest European regulations on disposal of electrical waste and the financial burdens that arise from these responsibilities. The article also elucidates novel approaches of some industries to recycle and re-market used equipment in order to generate additional revenues (content stimulus). By reading this, she comes up with the idea of developing a similar re-marketing strategy for her company. Customers should be motivated to return used telephone systems when they switch to a new

model. These will then be refurbished and sold again via a special web shop. The portfolio manger creates a service description for this new idea. When she adds the document to the system she is asked to classify it along several dimensions. One of the presented perspectives is ‘frequency’ of service provisioning which in her case is ‘one-time’ (inter-perspective stimulus). Getting this new perspective on her product-service bundle encourages her to think of possible services that are repeated on a subscription basis. From the frequency hierarchy she selects the ‘subscription’ category and discovers amongst others ‘remote diagnostics services’. The respective content screen offers a short description and diagram explaining that the service is completely virtualized and no extra hardware is involved (content stimulus). This evokes the idea in the portfolio manager’s mind that it could also be an option to completely virtualize a telephone system and merely handing IP-telephones to the customer. So, her company can substitute the error-prone and expensive telephone hardware by a software system that is centrally hosted.

4 CONCLUSION

Design research is concerned with “devising artifacts to attain goals” (Simon 1996). In this paper we presented a conceptual design and prototypical implementation of an IT system that supports creative work by both facilitating information retrieval and activating creative thinking in an integrated manner. We contribute to the IS body of knowledge by developing two artefacts: First, we developed a conceptual framework that is grounded in the existent literature and particularly draws from associative theories on creativity. The framework explains how multi-perspective navigation structures answer the aforementioned purposes. It can serve as an analytical and descriptive framework that can inform future research. Moreover, the framework provides a starting point for the development of new or the adaptation of existing information systems artefacts to support creativity. Second, we developed a prototypical implementation in order to evaluate the framework. We used the creative process of product-service bundle development to both elucidate and exemplify our design ratio.

Design research consists of the two basic processes of build and evaluate (March & Smith 1995). It must be noted that thus far, this research lacks evaluation that goes beyond a ‘proof of concept’. However, an evaluation in terms of a ‘proof by demonstration’ assessing the artefact in use is part of our future research agenda. For this purpose, a development process of a product-service bundle, as outlined in this paper, will provide the evaluation case. The developed system instantiation will be applied within this evaluation case to give evidence of the different stimuli types by analyzing the users’ interaction with the system while solving a creative task. In addition to supporting the evaluation of the theoretical framework, the IT system may become subject matter of assessment itself. Along with testing the system based on criteria such as efficiency, simplicity, ease-of-use, and elegance (March & Smith 1995), the impact on its users’ creative performance can be assessed. Firestien (1993) states that “the evaluation [of a creative product] must occur on a number of levels; not with a single factor, or a single total effective criterion score.” O’Quin and Besemer (1989) have developed a scale that allows to test whether a product is ‘creative’. It is called the Creative Product Semantic Scale (CPSS) and consists of three dimensions. These are novelty, resolution, and elaboration and synthesis. Particularly the first two dimensions (novelty and resolution) correspond to the understanding of creativity underlying this research that defines a product as being creative if it is original (novel) and if it is purposeful or appropriate (Seidel et al. 2008a).

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