# *EXTENDED ABSTRACT: A CONCEPTUAL FRAMEWORK FOR PERSONALIZING KNOWLEDGE DELIVERY SERVICES*

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## 1. Motivation and research question

Sellers of luxury items and services such as high-end car dealerships and hotels have always known the benefits of personalizing products and services to their clientele (Mittal and Lassar, 1996). More recently, innovations in information acquisition and mining technologies have allowed virtually all online sellers to personalize not only their products but also the product purchasing experience. While the benefits from business-consumer personalization are quite evident (e.g., Alba, et al., 1997; Choi, et al., 1997; Hagel III and Rayport, 1997; Peppers, et al., 1999), an important question confronting organizations that wish to invest in *internal* personalization relates to the purported benefits of such personalization strategies. Currently, the predominant focus of organizations and software manufacturers is limited to applying internal personalization solutions to *routine work*, e.g., systems for corporate travel and reimbursement, and tools for managing employee benefits. We argue that internal personalization strategies may have broader benefits – to the non-routine creative work involved in emergent knowledge processes, or EKP, as described by Markus et al. (2002). The application of internal personalization for EKP represents the next wave of Knowledge Management Systems (KMS). Such personalization, however, has not been sufficiently explored in prior literature, so we present a conceptual framework and findings from a field study on personalization of knowledge services for EKP workers. In order for EKP workers to benefit from this new wave of KMSs, four important challenges must be overcome: (1) knowing the worker, (2) updating knowledge about the worker, (3) addressing personalization vs. privacy issues, and (4) deciding what knowledge to inject. Hence, our broad **research question** of relevance to both researchers and practitioners is: *How can the challenges in personalizing knowledge delivery to stimulate creativity in an EKP context, be overcome in the design of a knowledge management system*?

To date, KMSs have not been designed specifically to overcome these four challenges when injecting knowledge to stimulate creativity. However, there are organizations today where individuals repeatedly personalize – albeit manually – injection of new knowledge to EKP workers to stimulate their creativity. We undertook an exploratory case study of one such organization, the Jet Propulsion Laboratory, where the successful injection of personalized knowledge (by humans) to create insights could be observed in the context of proposal coordination. Our study examines the actions taken and the decisions made by these human "personalizers" who constitute our **research sample**.

## 2. Research sample and data

The Jet Propulsion Laboratory is a Federally Funded Research and Development Center, operated for NASA by the California Institute of Technology. JPL "conducts space missions and develops technologies and instruments that enable the nation's scientific community to explore Earth and our solar system, other planetary systems, and the universe beyond," (JPL 2003, p.7). A significant portion of the JPL's funding is obtained through competitive proposals. The creative work of JPL proposers (EKP workers) is not simply in generating creative new science and technology ideas for space exploration, but in matching their ideas to the often implicit priorities of a particular proposal call. To aid proposers in this creative matching process, JPL assigns a Proposal Coordinator (PC) who is responsible for helping JPL maximize the chances of its proposers being selected to receive funding.

The PCs have been instrumental in helping JPL proposers achieve high success rates. In our initial discussions, the PCs attributed their success rates to injecting knowledge into the proposal writing process. Therefore, we felt that an investigation of how human "personalizers" such as the PCs accomplished knowledge injection would yield insights into overcoming the four challenges of personalizing knowledge injection.



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Data on the case were collected using three methods. First, over the course of several years, the first author was a routine participant in proposal writing activities at JPL and familiar with the role of PCs in the JPL proposal process. At the time of the start of the study, she was able to provide insights into how to structure field data collection and interpret comments from the field. Second, interviews with PCs were conducted using a structured interview protocol with a critical incident approach. The PCs were asked to consider a proposal they managed in the last year and describe the actions they undertook to facilitate that proposal-writing effort. They were prompted to describe suggestions they made to proposers and why they made those suggestions. The interviews, ranging from 45-90 minutes each, were conducted with eleven PCs (from a pool of approximately 40) recommended by upper management to represent a broad range of proposal activities and varying levels of experience. This was sufficient for theoretical saturation; i.e., after the eleventh interview, data obtained were no longer providing new insight into how the four challenges were managed (Eisenhardt, 1989).

Finally, the interviews were coupled with the development of a prototype KMS to support the development of science and technology proposals. Simultaneous with the interviews, PCs were asked about their needs for a KMS, shown early (mostly non-computer-based) prototypes of such a KMS, and asked for their feedback. The use of prototyping to study knowledge management in emergent knowledge processes is a methodology recommended by Markus et al. (2002). By observing PCs' reactions to prototype ideas, we gained additional understanding about how the PCs provided personalized knowledge delivery. In sum, the three data collection methods allowed us to adhere to the principles suggested by Klein & Myers (1999) for conducting interpretive case studies.

## 3. Findings and discussion of results

Our **results** shed light on how PCs overcame the four challenges of personalizing their delivery of injected knowledge to stimulate creative action in proposers. The PCs handled the first challenge of knowing their proposers by constructing a *dynamic injection requirements profile* (our term) for each proposer that focused not just on the proposer but also on the characteristics of the proposer's work context. This allowed the PC to "know" *what* the proposer's current interests might be for knowledge injection and to infer future challenges, *where* in the work process those challenges might arise and *who* might be appropriate to help in resolving those challenges. Thus, knowledge injection to stimulate new ideas was enhanced by dynamically knowing the proposers and their evolving work context. The PCs used this requirements profile to select from a list of delivery mechanisms. The PCs addressed the second challenge of how to keep the requirements delivery profile updated by asking for information that proposers were generating anyway. That is, proposers were not burdened to keep the profile updated; instead, PCs integrated the profile updating process into the work process, thus reducing the burden to the proposer.

The PCs addressed the third challenge of understanding proposers' internalization of the tradeoff between personalization and privacy by periodically demonstrating the benefits of sharing information. The PCs were able to alleviate concerns that the proposers might have about PCs misusing information by acting in ways that demonstrated they had the individual proposer's best interests in mind. This allowed the PCs to establish a trustworthy environment. Finally, the PCs addressed the fourth challenge of deciding what knowledge to inject by providing *actionable* knowledge, i.e., PCs did not simply inform proposers of inadequacies in their thinking but suggested positive steps to make changes. Thus, new ideas were injected that were coupled with actions. In addition, PCs often engaged proposers in a dialectic process – typically with technical experts – so that they could develop action steps together.

Figure 1 presents our findings as a model for conceptualizing personalized knowledge delivery services to stimulate creativity in EKP work. We argue that the model in Figure 1 is unique for EKP environments; personalizing for routine environments can probably ignore several of the factors, the flexibility required of delivery mechanisms, and the requirement for keeping the profile dynamic. The model has four critical components:

(1) *Five factors that must be part of a dynamic injection requirements profile*, which suggest that knowledge injection into a creative process requires knowledge not only of the user (i.e., worker characteristics and gaps), but the decision making stage, nature of the problem, and availability and reliability of knowledge sources (including the injector – such as the PC) to fill the gaps.

(2) *A flexible list of delivery mechanisms to choose amongst* which suggests that any KMS for injecting creative knowledge consist of delivery mechanisms which can be flexibly applied. We found that mechanisms in each of the four quadrants proposed by Alavi & Leidner (2001) are useful under various knowledge injection opportunities.



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(3) *Rules for matching delivery mechanisms to the profile.* This consists of rules for matching delivery mechanisms to the profile. We were surprised at how easily we could elicit matching rules from the PCs. Not only were the rules easily elicited, but an examination of the rules indicates that we did not find support for certain principles promulgated in the literature. For example, Clark (1996) suggests the rule of least effort, i.e., that the principle picked for communicating a message will be the one that takes the least effort. Instead, we found that PCs adhered to a rule of highest benefit, i.e., that the mechanism picked for communicating a message will be the one that has the greatest chance to influence the receiver. Thus, PCs saved their personalized messages that often involved the most effort, for those EKP workers who were most open to constructive feedback. Proposal writers that were not open to feedback would be sent to classes, sent email messages or not given any feedback at all. As another example, we did not find that PCs exclusively preserved their most personalized messages for the most equivocal tasks, as proposed by Te'eni (2001); instead, it depended on the other factors in the dynamic requirements profile. In addition, we discovered other rules, such as the rules of size, timing, and most credible source. In the consumer context, rules for personalizing have been researched and are now widely implemented in data mining techniques (Riecken 2000). For creative stimulation, the rules we discovered need to receive the same depth of research attention so that future KMS designs may benefit.

(4) *Regular updating of the profile, delivery mechanisms, and rules.* Our model suggests this is a necessary component of the design framework and by integrating information-updating with users' work practices as done by the PCs, this component can be implemented.

## 4. Significance to practice

Our findings open up two important questions: a. who or what should make up a personalized KMS for EKP workers? And b. what should be the design approach?

a. *Knowledge Management Systems: Human, Computer or Hybrid?* While the PCs in our study were all human, the rules for matching knowledge delivery mechanisms with the requirements profile and automatic routing of questions to experts could be computer-based. Similarly, a system with question-based inquiry could help EKP workers not just complete their work but become exposed to new knowledge during the work process – without the involvement of human PCs. However, the dialogue the PCs stimulated between the proposers and technical experts to help proposers rapidly generate actionable knowledge is probably best undertaken by a person rather than a system. Similarly, profiles can neither be generated nor updated entirely by computer as the process of identifying gaps in proposers' knowledge is in itself a creative act just as deciding on the type of knowledge to inject is a creative process. Further, the emergent nature of the EKP process suggests that the rules will need to be reviewed frequently to accommodate new work contexts. Finally, managing the personalization-privacy tradeoff of individuals is critically related to trust building factors (Chellappa and Sin 2003) and in order to maintain a trustworthy environment, a review panel may be needed that sets policies and procedures for using information collected about the users in the course of personalizing the knowledge delivery. If users believe these policies are violated, they must be able to turn to the panel to air their concerns (Culnan, 1999; FTC, 1998). Thus a KMS for injecting new knowledge into an EKP work process to stimulate creative thought will be more successful when it is implemented as a human-computer based system, rather than a human-only or computer-only based system.

b. *Knowledge Management Systems or Knowledge Management Services?* The concept of a Knowledge Management *System* does not adequately convey what the PCs were doing in this context. For example, the PCs matched EKP worker requirements profiles to a variety of delivery mechanisms available to the PCs on a flexible basis. Thus conceptualizing personalized knowledge delivery as a system may be too confining since systems typically have one delivery mechanism (by a user interface in response to a question or inquiry generated by the user). A personalized delivery requires a mechanism that can select from a range of services that dynamically match a requirements profile compiled for that person, time, and situation, e.g., Cisco's e-learning initiative that offers its users a range of alternative learning services, including video tapes, asking the expert, course descriptions and signups (Kelly & Bauer, 2003). A similar service approach for knowledge injection would imply a portfolio of services, each of which is invoked when certain profile conditions occur.

In summary, our research opens up an area of research that has so far been ignored by IS researchers: understanding how to obtain, personalize, and inject knowledge into an EKP to stimulate creativity (Alavi & Leidner, 2001; Markus et al., 2002). Our study specifically suggests that in order to personalize for EKP workers, a KMS should:



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- develop a dynamic requirements delivery profile by observing users during their normal work process and update this profile regularly with the help of a human support system
- have in its portfolio, a flexible list of delivery mechanisms
- include rules for matching the requirements profile with delivery mechanisms that is updated regularly with the help of a human support system
- adhere to clear policies about sharing knowledge that build trust in how the knowledge will be used
- focus on injecting knowledge that is actionable for the user.

Further, organizations can begin to develop new role descriptions by considering knowledge delivery services as a combination of human and computer-based knowledge service providers. For example, one implication of our model is to train people in a variety of different knowledge delivery services, just as firms train individuals in problem-solving techniques. Individuals could be trained in opportunity-recognition (i.e., the ability to identify opportunities for knowledge injection), knowledge source recognition (i.e., the ability to identify different types of knowledge sources to use to persuade individuals under different contexts), maintenance of a trustworthy environment under unpredictable circumstances and turning information into actionable knowledge. This also suggests that services delivered to facilitators might be different from those delivered to the users themselves.

Finally, our findings also suggest that while EKP workers place a high value on individualism, there is always a likelihood of similarities in roles. Companies can utilize these similarities and integrate knowledge delivery into everyday work by redefining job descriptions on the basis of roles played by people rather than by tasks performed by them. The baselines for user profiles can be developed to correspond to these roles thus jump-starting the personalization of the knowledge delivery services. In fact, IBM has recently announced a new research effort in this direction. Personalizing delivery of knowledge is an exciting arena today where companies are at the forefront in terms of implementation, therefore research and theorizing of constructs in this field can offer benefits to both the IS research and practitioner community.

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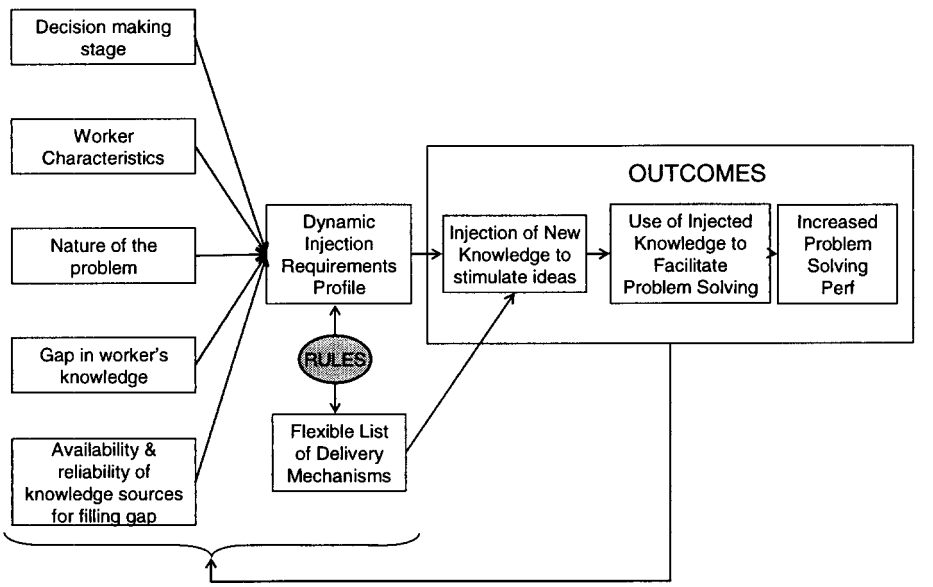


Figure 1: Model for conceptualizing personalized knowledge delivery services for EKP work



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