



Personalizing Knowledge Delivery Services for Emerging Knowledge Processes (EKPs): A Conceptual Framework

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What do most KMS in use today assume?

- They assume that the user
 - Knows the problem
 - Knows the community of practice
 - Has the expertise and knowledge needed
 - Is willing/able to invest time in interacting with KMS
- They assume that the organization implementing KMS
 - Can require the use of KMS
 - Can use past lessons learned
 - Can use previous consultant reports

Assumptions are violated when KMS is used by EKP workers – Why?

- Emergent Knowledge Processes (EKPs) are non-routine work with iterative divergent/convergent phases
 - Examples of EKPs include strategic planning, proposal development, innovation
- During divergence, workers don't know knowledge needed
 - Sometimes they need repeated exposure to variety of inputs & synthesis
- Problem & search strategy is repeatedly redefined
- Problem solutions often require accessing & synthesizing across initially unknown communities of practice
- Innovators will move forward without knowledge, albeit with lower quality

Current State of KMS for EKPs are inadequate

- EKP workers expected to proactively
 - Search knowledge bases
 - Craft questions for discussion boards
 - Find the right Community of Practice
 - Or sometimes search expert directories

- But EKP workers have neither the time nor inclination to do this

What would an “adequate” KMS for EKPs look like?

- Not expect innovator to do additional work, e.g.:
 - Background agent on the user’s computer auto uploads to the KMS
 - User simply has to click “publish” when ready to upload to the KMS

- Supports divergent thinking, e.g.,
 - Injects new strategic or technical knowledge such as links, experts names, or quotes
 - Identifies cause & effect assumptions, alternative ideas

- Supports convergent thinking, e.g.,
 - Keeps track of milestones
 - Provides templates that are partially completed based on writing already done
 - Provides design rationale capture

“User-as-Consumer” Analogue: Ecommerce/Eemployee Services

- An entity offering personalized products and services
 - Seen in luxury hotels and more commonly now in personalized Web sites such as my.yahoo.com
- E-Employee Services
 - cisco.yahoo.com and Cisco Employee Connection intranet.
- Based on anticipation of user needs; ability to acquire and process different types of information
- Focused on routine work

Why is an ideal KMS for EKPs hard to achieve?

- Automated injection and pre-fabricated templates require constant acquisition of user/usage information
 - Monitoring the user raises privacy and burden issues
- If incorrectly done, injected knowledge may lead to information overload
 - Users may begin to ignore the KMS
- Knowledge injection may have to be repeated multiple times before the user “gets” it (actually receives it)
 - Users may be annoyed with the KMS (fine line between persistence and annoyance)
- Users’ needs may change very rapidly, decisions may be highly dynamically-contextualized
 - It would be too difficult for a KMS to determine which information is most relevant to provide at any single point in time

So, what type of KMS design would work?

- Use human-based KMS for EKPs to see how they do it
- Extrapolate to a mixed-mode (human & system) KMS

Human-Based KMS for EKP - Proposal Call Managers at R&DLAB

- A “Call” is a request from a funding organization for innovative proposals in a particular area.
- Calls appropriate to R&DLAB scientists are received by R&DLAB several times a month.
 - Scientists compete for funds
 - Scientists voluntarily choose to write proposals alone or with collaborators inside or outside R&DLAB
 - Scientists have between 4-12 weeks to prepare the proposal.
 - All proposals must be approved via an R&DLAB review process which assesses technical quality and risk to R&DLAB if the proposal is funded

Proposal Call Managers (PCMs)

- A PCM's objective is to work with scientists to increase the probability that their proposals will be funded
- There are approximately 20 people who work as PCMs (often for multiple calls)
 - PCMs usually have a technical background
 - Assignment to a Call is based on availability, not just technical match
 - PCMs are each responsible for 1 to 15 calls a year

Specific PCM tasks

- Identify technical experts in the Call's technical area, who can review proposals before they get to review board
- Understand customer (funding agency) criteria in evaluating proposal and share this with proposal writers
- Identify ways to help proposal writers to develop proposals that have a higher probability of getting funded
- Offer courses in proposal-writing
- Ensure proposal fits with R&DLAB's strategic goals
- Ensure that proposal reflects well on the organization
- Ensure that proposal meets regulatory constraints, and has a viable technical, cost, and management approach.

Why is a R&DLAB PCM a human metaphor for a KMS for EKP?

- PCMs try to influence innovators and an innovative process (proposal writing)
- PCMs have a knowledgebase that is not often known to the innovators, in particular about:
 - Customer (funding agency) needs
 - How to strategically position the proposal
- Innovators do not have to use PCM's knowledge

Data Collection

Interviews with PCMs (8 done so far, 15 by June)

- Describe cases of influencing an innovator.
- Describe factors they considered when deciding on what knowledge to provide the innovator

Knowledge typically injected:

- need for collaboration to increase the total amount of dollars coming to R&DLAB even if not a PI,
- identify possible collaborators,
- problems in writing the proposal to meet submission (called “compliance”) requirements,
- technical guidance and recommended experts to talk to,
- how to tie work to customer needs.

Finding #1

- PCMs weren't just deciding WHAT knowledge to inject, but also:
 - WHEN to inject it during the innovative process (including # of times) and
 - HOW (where more than one way is often considered).
- PCMs seemed to make several subdecisions about "HOW" to deliver the communication, corresponding to Te'eni's subdivision into:
 - Communication strategy (do I include in message contextual and/or affective and/or perspectives and/or control and/or attention-focusing information?),
 - Media choice (eg., classes, generic email, personalized phone call by PCM, or review and discussion with technical expert?), and
 - Message form (distribution – generic or personal, organization and formality).

Finding #2

- Not all messages needed to be sent with the same degree of personalization

Finding #3

Decisions about WHEN and HOW to inject new knowledge were based on a set of context factors that PCMs took into account. Four context factors were considered:

- Factor 1 - Problem Equivocality
- General rule seemed to be:
 - the more equivocality in fixing the problem, the more personalized and the earlier the message would be delivered.

Factors affecting How/When

Factor 2 – Credibility of Knowledge source from which knowledge to be injected was acquired

- What was defined by the proposer as credible depended on what type of knowledge was being conveyed.
- For problem types varying in equivocality, there were different credible knowledge sources, e.g.,
If problem=customer fit, credible source was PCM themselves;
If problem=technical knowledge (less equivocal), credible source was a senior technical person in field.
- General rule seemed to be: Have the knowledge source considered most credible be the one to deliver the message.

Factors affecting How/When

Factor 3 – User characteristics

- PCMs paid particular attention to 2 characteristics of users:
 1. Openness to constructive feedback
 - One general rule appeared to be: “rule of most malleable receiver” (a significant modification of Clark’s rule of least effort): I.e., PCMs saved their Personalized messages, which involved the most effort, for those people who were most open to constructive feedback (often neither younger nor older).
 2. Greatest Need
 - Since more experienced proposers are perceived to win more, the PCM should try to help the less experienced “folks”.

Factors Affecting How/When

Factor 4 - Nature of User's Work Process

- PCMs would examine two aspects of the work process in contextualizing their messages:
 1. Size of the proposal effort
 - The larger the proposal, the greater risk to R&DLAB and thus more effort in injecting knowledge was made.
 2. The problem-solving stage.
 - PCMs would inject different knowledge if the proposers were at the divergent vs convergent phase of innovation. The general rule appeared to be:
 - During divergent phase
 - Inject strategic and risk-based knowledge
 - During convergent phase
 - Inject procedural and communication-based knowledge

Factors Affecting How/When: Summary

- PCMs could identify not just the 4 contextual dimensions that affected their decisions but also the tacit rules for how these contextual dimensions affected their communication strategies.
- Example rule: cooperative user + inexperienced user + problem type is such that user needs communication/strategic help + early in proposal stage = assign advisor to work one-on-one vs. late in proposal stage
- ***Thus, even in an inherently unpredictable process such as an EKP, rules can be derived for how knowledge is best delivered.***

Finding #4

- For PCMs to contextualize information, they needed to know a great deal about the proposer.
- They obtained info NOT by overtly requiring proposers to provide information for the sole purpose of the KMS. Instead they had weekly meetings & communiques for knowledge-sharing with each other and used intermediate products to assess progress

Finding #5

- Since PCM's are monitoring the proposer's environment, the proposer must trust in how the PCM will use information.
- Trust was inferred by the proposer being convinced that the PCM was making suggestions "in the best interest of R&DLAB". Thus, the proposer needs to trust that the PCM will offer help rather than "kill" his proposal.

Implication#1 for a KMS for EKP: From System to Service

- Context-specificity requires a range of services (link, rewrite of proposal, expert name, class)
 - We label this a Personalized Knowledge Delivery Service (PKDS) for EKPs, not a KMS for EKPs.
- Ex: Luxury hotels (e.g., Starwood managed properties): from the time a customer checks in to when he checks out, all activities are observed to provide utmost personal service, e.g, the right newspaper to in-room fax to even personal valets.

Implication #2: From technology or human-centric to Mixed Mode

High degree of contextualization requires that PKDS cannot be entirely automated. However, if new knowledge is to be injected, reliance on humans alone is particularly problematic. Therefore, a PKDS must be a mixed-mode system.

- Instead of an expert directory, a service might be a knowledge broker who can help to identify which experts would be appropriate.
- Instead of a knowledge search engine, an automated system might ask questions of the proposer that would encourage them to consider ideas from alternative domains.

A Knowledge Delivery Service needs to allow the possibility of all of these types of services.

Implication #2: From technology or human-centric to Mixed Mode

➤ Example

- FedEx allows organizational users to track their status of shipments, while still allowing for human intervention and personalized response under special circumstances such as a phone call from a FedEx agent.

Implication #3: From Simple User Profiles to Dynamic Delivery Profiles

- Delivery of knowledge to an EKP requires knowing far more than simply the user profile. The service delivery must also know the
 - **credibility of the knowledge source,**
 - **the problem-type**
 - **the nature of the work process.**
- The PDKS must be able to construct what we call a “dynamic delivery profile,” composed of contextual information about the
 - work, problem, user, and knowledge source
- that is continuously
 - constructed, refined, and refreshed dynamically
- over the course of completing the EKP task, and which informs
 - when, how and what knowledge should be injected

Implication #3: From Simple User Profiles to Dynamic Delivery Profiles

➤ Example

- Cisco Employee Connection is an organizational system that maps employee preferences for
 - Travel arrangements
 - Training requirements
 - Technical manuals
 - Meeting attendance
- This allows for an employee profile to be creating allowing personalized knowledge delivery at the desktop level

Note much of this personalization is not focused on EKP, rather routine processes.

Implication #4: Maintaining a trustworthy environment

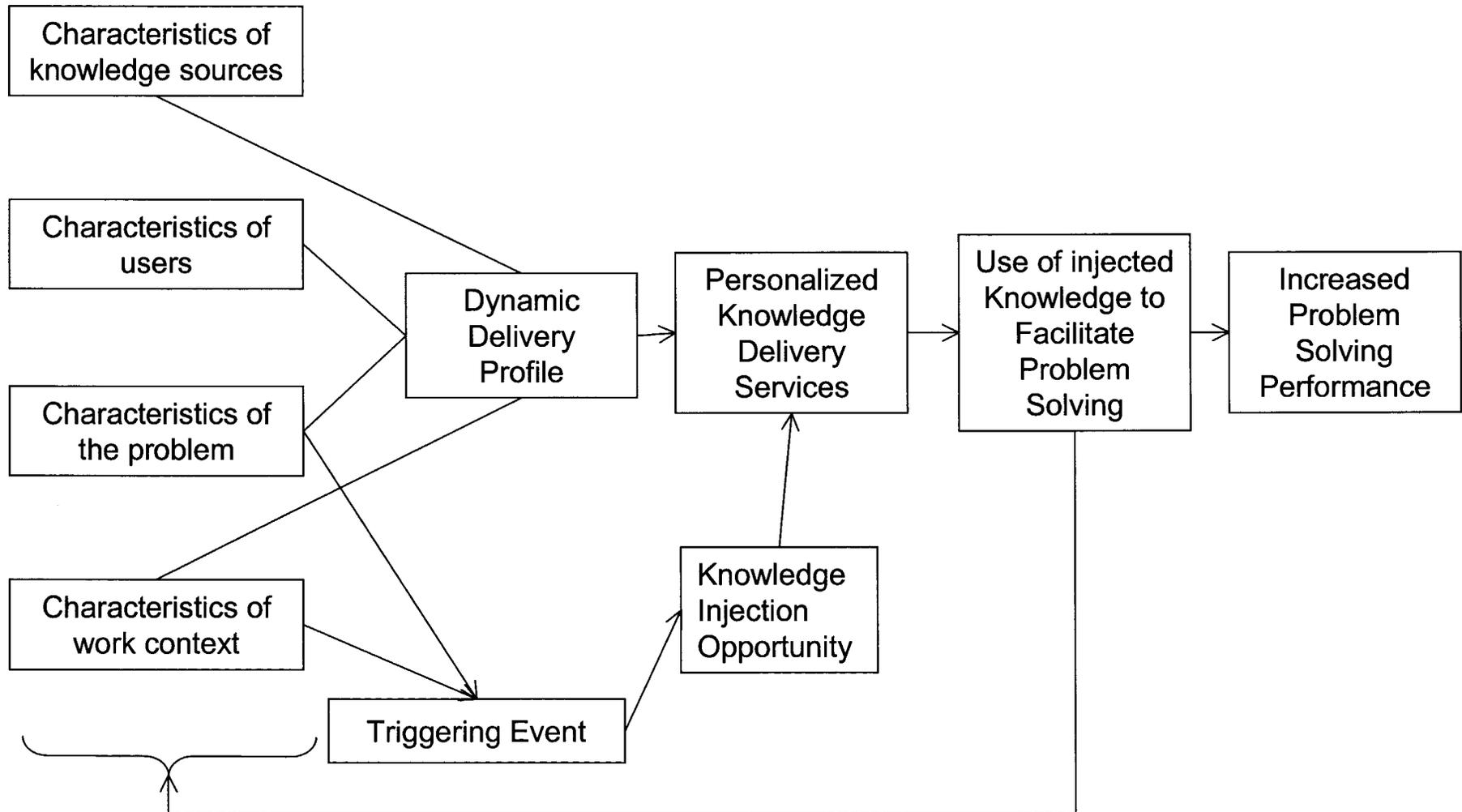
- In addition to acquiring user/usage information, contextual information must be acquired as a part of one's work.
- Humans need to explicitly inform the users of the type and nature of information being collected. Rules need to be established about what information gets shared, whom it is shared with and how it is used. These rules need to be reviewed periodically.
- Users of information systems have always been concerned about the "procedural fairness," of information acquisition thus requiring trust building activities (Culnan and Armstrong 1999)

Many corporate and governmental entities today have incorporated information collection rules into their organizational privacy policy manual, e.g. the EPA fully informs its employees of what information is collected and how it is used.

Implication #5: Constructing a dynamic delivery profile

- Since rules for delivering services can be constructed given a particular dynamic delivery profile, some degree of automation is possible, even in a work process as unpredictable as an EKP.
- Human review of the rules over time is needed, of course.
 - At 3M, information scientists work with chemical scientists to develop effect alerts for new knowledge that may apply to their technical domain. Once the alert algorithm are formulated, they are reviewed at least once every six months to determine if changes are needed.

Implications for Research: Model



Example Research Qs on KMS Support for EKPs

- Can a mixed mode PDKS affect the innovativeness of a user?
- Although there are instances in corporations for parts of a PDKS, there is no comprehensively designed PDKS. Can a partially created one achieve some benefits, or must one have a complete one?
- If users see the benefit, will they allow their behavior to be monitored in enough detail to ensure contextualized services?