

Eliciting and Validating Knowledge in Knowledge Management Systems

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Abstract

This article identifies two significant challenges in implementing Knowledge Management Systems (KMS), then, proposes solutions based on information economics. A knowledge market perspective is suggested to (i) elicit new contributions and (ii) identify higher quality content. Case studies from Siemens and HP, illustrate their application, and are used as a frame of reference to devise some preliminary steps in designing knowledge markets inside the boundaries of a firm.

1. Introduction

Most large organizations implement Knowledge Management Systems (KMS) to create value and enhance organizational effectiveness for one or more of their critical business processes. The Gartner Group predicts that from 2006 to 2010, organizations will continue to invest in KM as a critical component of their high-performance workplace (HPW) initiatives [14]. A recent *Economist* survey—the Foresight 2020—finds that 45% of the 1650 executives interviewed believe that KM offers the greatest potential for productivity gains in the next 15 years [13].

Knowledge Management Systems that truly enhance the productivity¹ of knowledge workers,²

¹ Productivity refers to the definition of total factor productivity, an aggregate measure of performance used in economics. It typically measures total output, including quality, divided by total factor input, including price deflators. At the individual level, manual worker productivity has been studied for nearly a century since Taylor's work on scientific management and is often indexed by the quantity of goods and services produced per hour of labor after accounting for input capital.

² The term "Knowledge work" was first introduced by Peter Drucker in the 1960s as any work that requires mental rather than physical power. Davenport (2005) defines knowledge workers as people with high degrees of expertise, education, or experience, and the primary purpose of their jobs involves the creation, distribution, or application of knowledge.

however, can be difficult to build. *First*, complex knowledge is difficult to transfer and challenging to evaluate. *Second*, workers require appropriate incentive mechanisms to contribute high quality knowledge, and to make use of the KMS platform in their ongoing operations.

We believe that managers underestimate the complexities involved in managing the KMS triangle: knowledge dynamics, the platform, and the players—producers and consumers. Research identifies the market view as a good method for analyzing knowledge dynamics in KMS [7, 15]. The market view allows us to consider simultaneously: (1) "the asset" to be traded, as well as its unique characteristics, (2) the knowledge market players, i.e., consumers vs. producers, (3) the knowledge exchange platform and potential changes in interactions over time.

This paper, consequently, employs a knowledge market perspective, using economic principles to explore the following research question: *How organizations can create an effective internal market for knowledge over the long term?* This perspective addresses key challenges raised in the management of KMS. Our contribution consists of analyzing the potential of "internal knowledge markets" to solve the impediments of traditional KM approaches, as well as devising preliminary steps for their design inside organizations.

The paper first discusses the research methodology, illustrating the sources of data used in this article. Section 3 highlights some of the challenges of traditional KM approaches. Section 4 explores the possibility of solving these problems using internal knowledge markets among employees of the same company. The final section builds on two case studies to devise some preliminary steps in designing knowledge markets and discusses some research extensions.-

2. Methodology

In exploring knowledge markets as a means to address issues in traditional KM, we build on several primary and secondary sources. Primary sources include interviews, as well as empirical analysis of the challenges of several Silicon Valley firms [5, 6]. Company examples and quotes drawn from these earlier studies illustrate KM problems real organizations face. HP and Siemens case studies show how carefully designed systems can still run into difficulties. We use key ideas from information economics [1, 3, 16, 25] to identify sources of market failure and propose design strategies for resolving them. In particular, we rely on these works and recent work on “two-sided” networks [12, 26] to launch knowledge platforms and sustain development of new content. These provide steps for moving knowledge markets inside organizations.

3. Challenges to traditional KM

We focus here on three common problems of traditional KM approaches for which “market mechanisms” can provide a remedy: (1) knowledge’s unique attributes, (2) connecting knowledge producers and consumers, (3) providing incentives in proportion to participation.

3.1. Managing knowledge as a unique asset

Unlike traditional fungible commodities knowledge is an information asset with unique properties that makes its effective and ongoing management more challenging. Here, we summarize three of these attributes.

3.1.1. Knowledge as both a public and private good

First, knowledge has a *public goods* aspect that allows firms to exploit it in diverse locations at little or no additional cost. This aspect consists of two properties: *non-rivalry*—implies that one person having an asset does not prevent another person from having it also, and *non-excludability*—implies an inability to bar someone’s use makes it difficult to charge for or meter use of that good. It is well known in economics that public goods are under-supplied unless there is some kind of public subsidy that leads to their creation. We use this fact later to

solve the elicitation problem.

While knowledge is often considered a public good [3], it nevertheless retains a *private good* aspect which makes it difficult to transfer without the context in which that knowledge is developed, used, and “owned”. Indeed, knowledge resides within individuals and, more specifically, in the employees who create, recognize, archive, access, and apply knowledge in carrying out their tasks. This makes knowledge difficult to transfer into a KMS without a fair return for owners’ time and energy. Context provides a constellation of meanings that both informs and constrains socially acceptable means of capturing, transferring, archiving, and disseminating knowledge.

3.1.2. Knowledge as an experience good

Second, knowledge often qualifies as an “experience good” [25]. It usually needs to be consumed at least once to know its value. Even high quality knowledge can go unrecognized and unappreciated until a person has tried using it. For this reason, organizations often build KMS around standardized work practices and they attempt to provide recognized solutions to recognized consumer needs in advance. An initial group of consumers must then be enlisted to provide evaluations of the KMS content via ratings that will facilitate future consumers’ evaluation and subsequent adoption.

3.1.3. Knowledge lifecycle

Third, as an economic good, knowledge is subject to depreciation. In particular, knowledge depreciates when skills deteriorate, when content becomes dated, or when new knowledge renders it obsolete. While a handful of scholars acknowledge a knowledge lifecycle, most research in this area has focused on initial knowledge elicitation and ignored changes in value over time [7]. As a consequence, the knowledge validation process remains largely understudied. In this paper, we retain the existing literature’s set of discrete knowledge life cycle activities and summarize them into the processes of knowledge elicitation and knowledge validation.

Knowledge elicitation is the process of collecting the knowledge from different sources and making it available for future use on the KMS platform.

Knowledge validation is the continuous process of verifying, updating, upgrading and

adapting knowledge to the consumer's needs.

3.2. Connecting producers and consumers

Connecting knowledge producers to consumers is one of the primary issues organizations face with their KMS implementation. Each group faces a dilemma:

- 1) Why would *producers* spend time and energy contributing to a KMS?
- 2) Why should *consumers* apply untested knowledge they find in a KMS?

This pair of questions illustrates a chicken-and-egg dilemma. If producers don't participate, consumers have nothing to apply. But if consumers don't apply the resources, no extra value is created with which to reward producers.

To solve this dilemma, traditional KM approaches tend to prioritize development based on addressing the most critical knowledge for achieving the organization's strategy. Or, they cover knowledge problems representing the greatest scale or affecting the most people. While this approach can work in organizations with well-defined knowledge producers and consumers, or small units working on homogenous areas, for most large companies, it produces mixed results. In these settings, it's impractical or infeasible to respond to all knowledge workers at once, or treat them all alike [9]. At best, these organizations end up addressing a very small fraction of the "market"—a small group of workers with defined and focused knowledge needs.

3.2.1. Transaction Costs

Not surprisingly, then, a growing number of workers cannot find in the KMS the knowledge they need. This experience trains them to gradually abandon their search for valuable content.

This was captured in the common complaints succinctly voiced here by a knowledge worker and KM manager:

"I just can't find the knowledge I need; I spend a lot of time searching the KMS and end up with irrelevant material"

"Our KM capability falls short of what is needed. ...There should be someone identifying where there is lack of knowledge and getting the gaps filled. There should be someone making sure that the knowledge we have is consistent and does not conflict. We should have one of everything. We have many versions of some elements and some elements missing".

In effect, the "transaction costs" of locating what is needed, correcting for errors of omission and commission, and verifying value all reduce the value of KMS to the point where users can prefer to avoid using the system.

3.3. Defining appropriate incentives

Effective rewards for knowledge workers in large disconnected organizations differ from those available in small close-knit groups. Reciprocity can be expected from participants in small units, but in large organizations the potential for reciprocity drops dramatically and workers often see no reason to share [21].

To solve this challenge, organizations rely on incentive mechanisms that may represent real monetary value for knowledge objects or rely on proxies that can be redeemed for cash or other gifts.

This approach has potential but remains problematic when it fails to reward workers *in proportion* to their contributions and may even favor knowledge quantity over quality [18]. The following case studies from HP and Siemens illustrate better these issues and are used in the following section to devise initial steps in designing internal knowledge markets.

HP Case study

HP established an incentive program based on frequent flyer miles certificates [17]. The miles an individual could earn were capped at 20,000 and the period in which the miles could be earned was "3 months or until the company run out of certificates". The activities being rewarded could be easily monitored and measured.

- Successfully installing Lotus Notes and reading a posting: 4,000 miles
- Posting a useful resource for others to share: 2,000 miles
- Posting a request for assistance: 1,000 miles
- Posting a response to a request for help: 500 miles

First, there was a tremendous amount of positive buzz about this program, especially in the US. Because this was one of the very first times that airline miles could be earned any other way than flying, it created a real stir among the employees HP was trying to reach. The relatively small time window, plus the concern that there might not be enough miles to last the whole 3 months, created a real sense of urgency.

As a result, eligible employees did install the

software and post messages at a gratifying rate. But 90 days after launching the program, the company still had only gotten about 20% of the target audience to install the Notes software. HP faced three hard choices. It could:

1. End the program and try to figure out some other approach to engage the remaining 80% of the target audience
2. Increase the incentive levels
3. Continue the incentive program on the same terms

This is a fork in the road that every limited-time incentive program comes to.

If you choose option #1, it's a real challenge to figure out an alternate incentive scheme that will appeal to the 80% of the audience who ignored the first program. And you also have to decide whether individuals who have already started using Notes will be eligible or not. If you make them ineligible, you may alienate all of your current users. If you make them eligible, then a lot of the second round incentives will go to people who are already behaving the way you want them to.

If you choose option #2, you may also alienate the people who got the lesser first-round rewards. And you'll also probably have to really crank up the reward levels to get much traction. The more you crank up the awards, the more you risk alienating current users.

Option #3 is the least objectionable, but also probably the approach that will bring in the fewest new Notes users. This is the path the company has chosen, in large part because it still had a substantial number of mileage certificates on hand.

Siemens case study

The first incentive system introduced by Siemens to foster knowledge sharing through its KMS Sharenet was called "Bonus-On-Top". It provided incentives for local country managers, and rewarded a country's overall participation in knowledge sharing. Sharenet managers noticed that knowledge sharing with colleagues they don't know didn't happen easily. Contributing to Sharenet was felt counter-intuitive as it meant giving up their individual power for the benefit of the whole organization. Consequently, Siemens awarded a bonus to both the country that had contributed the knowledge and the country that used it. If a country's sales team managed to secure a certain amount of business

with the help of international knowledge sharing, they received a bonus. Nevertheless, although a considerable number of country managers did receive the bonus costing Siemens a significant amount of money, its ultimate benefit on Sharenet was not clear. Sharenet managers recognized that they valued recognition over monetary rewards. Therefore, the managers decided to focus more on the users themselves.

To ensure that Sharenet becomes and remains an integral part of their work, the company rewarded both producers and consumers of knowledge with "shares" or bonus points, much like in an airline mileage system. Shares were awarded for entering knowledge bids into the library, reusing knowledge, responding to urgent requests, and appraising one another's contributions. The number of shares awarded depended on the type of contribution, for example:

- Answering an urgent request: 3 shares
- Developing customer, technology or market bids: 10 shares
- Contributing solutions and success stories: 20 shares

These shares were later redeemed for prizes to foster their individual knowledge. This incentive scheme seemed to have an immediate effect on the motivation to share as it generated a significant increase in contributions.

Nevertheless, the quality of the knowledge shared was inferior leading the company to adopt a rating system.

Subsequently, whenever a member reuses knowledge of a third party, he or she also provides feedback on the website, indicates how, for example, they used the solution, together with comments and suggestions, their own specific experiences and a subjective rate of the value of the contribution which is a basis of the incentive system. As a result, for a user to redeem his or her shares, contributions and ratings are first evaluated, then, the appropriate award is approved.

Despite accumulating large numbers of shares, however, few users ever converted them into prizes. Sharenet managers speculated that the knowledge had become its own reward, and users did not want to relinquish the status of a high share total by redeeming it. Later, when resources for such initiatives became scarce managers had difficulty justifying the continuity of these incentives mechanisms.

4. The “internal market” as a viable approach

If a market-based approach can provide a blueprint for knowledge exchange among producers and consumers in large organizations with dispersed knowledge, what are markets and how can they cure the ills of KM discussed earlier?

4.1. The market as an effective means of exchange

Market is the term economists use to capture what happens when one individual offers to make or sell something to another individual at a price agreeable to both. In this perspective, markets are good at producing things that people are willing to pay for. A large body of economic theory and historical experience indicates that markets are, on the whole, remarkably effective in promoting efficient, cooperative interactions among entities with diverse knowledge, skills, and goals [16].

Markets seem, consequently, to perform at least the following functions:

- Enabling buyers and sellers to find each other
- Allowing individuals to make the kind of consumption choices they prefer
- Establishing accurate prices based on supply and demand
- Validating (or rejecting) product and service offerings

Internet-enabled markets are recognized today as means of achieving greater efficiency in almost every sphere of activity [2]. They are used to exchange physical commodities (books, CDs, collectibles), services (IT, accounting, administrative support) as well as information and knowledge.

While the potential of external markets has been largely studied, using market-like processes inside the boundary of a single firm (“internal markets”) is just starting to emerge. And several companies are experimenting their potential [21].

4.2. Knowledge markets

The internal knowledge market, on the other hand, can be considered as a “quasi market”, as its transactions cannot be enforced by formal contracts [10]. It’s a logical space where buyers (*consumers*) and sellers (*producers*) can exchange knowledge products and services

through the KMS platform (Figure 1). Producers provide their knowledge to consumers, and expect to be ‘paid’ with recognition and reciprocal exchange. Knowledge buyers are willing to pay if they agree that the knowledge is useful and can deliver results.

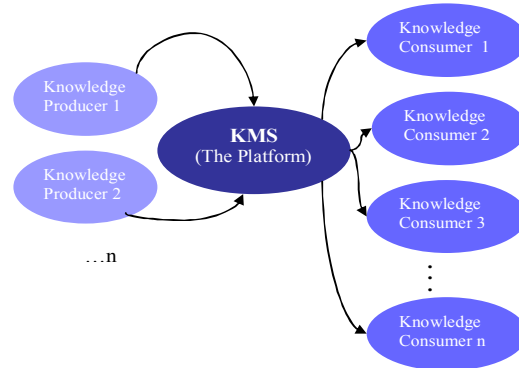


Figure 1: Knowledge market players: *producers* vs. *consumers*

The concept of knowledge market is not new and has been suggested as early as 1945 by Nobel laureate F.A Hayek [16]. Hayek shows that the market perspective addresses the dilemmas of dispersed and imperfect knowledge among different people when: (1) Possessors of this knowledge are informed by the market which kinds of things or services are wanted, and how urgently they are wanted. (2) Producers and consumers discover what are the optimal prices and costs for products (3) Prices represent accurate indicators of the actual supply and demand.

In this sense, the market perspective provides a remedy to traditional KM approaches as the knowledge provided by producers is customized to address particular consumer’s needs. And *payments* for knowledge producers vs. consumers are determined in such a way that the market players have every incentive to give a truthful and accurate outcome.

Introducing a knowledge market inside the boundaries of a particular firm is not an easy task. In the following, we devise some preliminary steps for organizations to initiate and sustain knowledge markets.

5. Toward a framework for designing knowledge markets

5.1. Initiating the knowledge market

One of the first challenges in defining knowledge markets involves *knowledge elicitation*—making knowledge a public good that can be codified in the KMS platform.

Initializing a knowledge market is especially difficult relative to maintaining it. Consumers and producers face a chicken-and-egg dilemma: at the point of launch, the system has no knowledge to share. Consumers have nothing to consume, to redistribute, or to value. But with no one to value their input, producers are better off sharing directly with grateful colleagues rather than incur the opportunity cost of codifying their expertise for a system that no one yet uses.

Codifying knowledge also implies that it becomes a public good available to anyone throughout the firm and not the specific property of any individual. Commoditizing expertise can transfer economic surplus from individual contributors to the organization and reduce the desire to provide it to others.

This problem has been solved in a different context and recently been formalized as the theory of “two-sided network effects” [12, 26]. These models address the simultaneous problem of new technology adoption and content creation. In the 1950s, for example, no producers would develop color TV content because no households owned color TVs. But no household would buy a color TV before producers developed color content. The same problem applies to HDTV content, streaming media content, operating systems content, satellite radio content, and almost every other formatted information. KMS represent a platform for delivering specialized content produced by autonomous distributed contributors and consumed by autonomous distributed users.

Successful market launch of two-sided networks relies on two important strategies, *seed and subsidize*. First, the main platform sponsor must seed the market with critical content. RCA used this strategy to launch color TV by contracting with Disney to produce color content. Second, the platform sponsor provides a subsidy to key producers to promote content creation. To facilitate roll-out of MS Windows, Microsoft gives developers system development toolkits and extensive software support. The analogy for KMS is to first provide critical knowledge on the most pressing consumer problems, introducing a “hook” that stimulates consumer adoption. The KMS sponsor then provides contributor benefits that exceed the opportunity cost of codifying

knowledge and reducing the loss in comparative advantage from giving up expertise. Firms do not always comprehend the complex dynamics but, when properly managed, they can create virtuous feedback loops, as in Figure 2, that resolves the adoption and content creation problem.

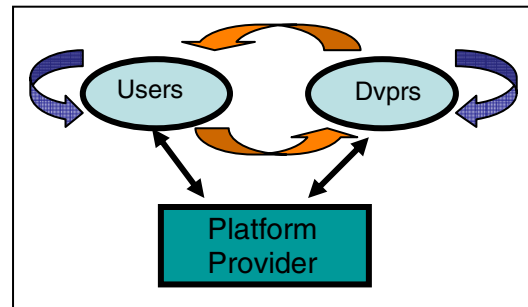


Figure 2: The consumer – producer relationship is exactly analogous to the user – developer model recently proposed to model software development and content creation in 2-sided networks.

For this, potential knowledge consumers could express their preferences and knowledge needs. The organization aggregates potential consumer preferences that may be useful in prioritizing new knowledge development efforts. The aim is to prioritize and identify knowledge needs of consumers, or those they prefer the most. The firm should, afterwards, provide producers with appropriate incentives to develop knowledge quality that consumers can use in accomplishing their tasks. Whether knowledge remains a private good in an employee’s mind or is contributed to the KMS depends on potential incentives and their alignment with organizational objectives. While attempts have been made to understand and define appropriate incentive mechanisms for knowledge elicitation, the process remains challenging [4, 26]. The benefits (acting as motivators) expected from contributing quality knowledge to the KMS are often small in comparison to its cost (acting as inhibitor) [17]. Inefficiency and a loss of organizational surplus occur because no one employee is willing to underwrite this cost, even though the aggregate benefit to the organization is potentially large. In defining incentives, organizations should, consequently, pay particular attention to: (1) rewarding the quality of contributions over their quantity and (2) not overlook the temporal dimension of incentives.

5.2. Running the knowledge market over time

Initiating the production and consumption of knowledge in knowledge markets is an important indicator of effectiveness. Yet, it does not necessarily lead to the desired managerial outcome unless the participants continue in their production and consumption of knowledge. The HP and Siemens examples confirm that continuance in KMS production and consumption of knowledge constitutes a significant challenge for organizations. We mentioned earlier that initiating an internal knowledge market depends primarily on *seeding the market* with critical knowledge and *providing a subsidy*—defining an initial incentive level to the players. Afterwards, organizations should (1) let the market define appropriate knowledge needs and price levels based on supply and demand, as well as (2) validate knowledge and reduce transaction costs.

5.2.1. Eliciting and pricing knowledge based on supply and demand

This can be handled by first providing better information both to and about the market. The HP and Siemens cases fail this test as their design actually loses key indicators of which knowledge is essential. We know from basic demand and supply economics that efficiency requires prices to adjust. In contrast, both the Siemens and HP models effectively fixed prices i.e. technology, market, and customer information each receive the same points or shares regardless of quality or criticality. If 10 shares is too low, then information (especially critical information) will be under-supplied and low quality information can be oversupplied merely to earn the default 10 shares. Consumers may find the system contains inessential or inapplicable knowledge. Conversely, if prices are fixed too high, not only does the firm overspend on direct subsidies, the excessive price diverts contributors from other value adding activities. The solution is to have consumers provide information about which issues are critical by offering their willingness to pay shares from a fixed budget. They will naturally offer more for higher value or more time-critical information. Two principles can be applied for this.

The first principle is to let prices float. Fixed prices, whether in currency, points, or reputation benefits create an oversupply of low quality

content and undersupply of high quality content. A knowledge market in which the most valuable participants abstain is a failed market [10]. Thus, KMS design should have consumers post the value they will transfer from their budget for knowledge they wish to receive. Higher offers should call forth resources with more value and higher opportunity costs of providing them. If answers are not forthcoming at a given price, the buyer can raise the offer, band together with other buyers, or go generate the answer independently.

The second principle is to compose the collection of consumer budgets as a balanced micro-market economy. After system launch, inflows and outflows should balance so that points do not deflate in value. Outflows occur as people redeem points they have earned (or they can expire to encourage use) being careful to maintain visibility for earned point totals as a continuing incentive to boost reputations. Inflows should occur at a rate proportional to the company spillover benefits from using and reusing the KMS. This constitutes the basis of the ongoing subsidy necessary for the creation of public goods.

However, once the knowledge good is created and enters the market, the contributor should be motivated to keep knowledge up-to-date.

5.2.2. Validating knowledge and lowering transaction costs

Once implemented, a KMS will be effectively used if it contains useful, relevant knowledge that is of high quality and up-to-date. If knowledge becomes obsolete over time, the organization cannot sustain knowledge asymmetries. These issues follow the same rules as the “lemons” market postulated by Nobel laureate George Akerlof [1]. Akerlof presents the used car market as an example of quality uncertainty. The buyer does not know beforehand whether a used car is a good purchase or is defective (a lemon). So the buyer's best guess for a given car is that the car is of average quality; accordingly, he/she will not be willing to pay any amount above that for average quality. The problem is that cars with much better than average quality then stay out of the market. Over time, as adverse selection occurs, proportionally more lemons are sold and buyers are willing to pay even less. This pushes the middle quality cars out of the market and,

without some kind of intervention, used car market prices collapse.

Moving to the internal knowledge market, if knowledge objects sold are inaccurate or of low quality, this market too will collapse. To avoid the “lemons” and maintain knowledge quality, companies need to provide ratings, reputations, and the equivalent of “consumer reports” to prevent break down in the knowledge market. If the market is small, dedicated experts can provide their own and approve others contributions. If the market is large, then a system of peer review can provide the critical evaluation.

Consumer behavior also exerts its influence; organizations must analyze how users interact with the KMS platform, and continue motivating consumers to reuse the knowledge assets in order to sustain the process. For this, organizations increasingly rely on users’ feedback (rating) on content quality to improve subsequent search and evaluation [23]. The company publishes the cumulative ratings to both sides of the market, producers and consumers. This is the approach Siemens uses to maintain knowledge quality in Sharenet.

Organizations must monitor these ratings, as those supplying the ratings may manipulate the values, either intentionally or unintentionally. For example, knowledge workers may use high quality content in an inappropriate context and subsequently rate the content quality low. Alternatively, workers may submit inflated evaluations of their own contributions, attempting to enhance their reputations and earn additional incentives [11, 24]. To avoid this, organizations should ensure consumers can only vote on assets other than their own, and should conceal producers’ identities during the preliminary evaluation phase. This mechanism enables organizations to assess the quality of knowledge assets, and provide potential consumers with a content evaluation.

Ratings—both explicit and implicit—can also be used to validate knowledge; below we describe how this process works.

Explicit and implicit ratings as well as ex post reevaluation constitute a good means for dealing with the experience good problem. If a buyer considers an answer incomplete, contributors can be given a chance to raise the completeness of their answer. Supplied answers need to work as promised or the buyer should get a refund. The points transferred (or not) represent the explicit rating of value since this is what the buyer or aggregated buyers paid to have

it generated. Additionally, however, the KMS should track implicit ratings that evaluate reuse. Implicit ratings report on subsequent search hits and downloads by everyone using the system. For example, even after libraries have purchased specific articles for their patrons, Elsevier keeps track of subsequent article downloads to learn which content is the most popular [20].

Interestingly, updates and maintenance can be flagged and corrected using exactly these same mechanisms. If once popular content stops being used, the change can generate a request for updating or culling. If a user notices a discrepancy or finds a resource is obsolete, the same elicitation postings and reward systems used to generate original content can be used to correct that content. The former approach uses the centralized KMS to identify maintenance issues. The latter approach uses a decentralized user discovery approach.

Further, to lower the “transaction costs” of locating what is needed, correcting for errors of omission and commission, and verifying value a third principle may be used. For example, wiki style links back and forth across KMS resources reduce transaction costs in multiple ways. They provide context that makes a given resource more useful. They provide a secondary means of rating that resource as more links represent implicit votes and implicit quality. They also provide a means of sorting responses to platform queries analogous to Google’s page rank algorithm. These features reduce Type I (false positive) and Type II (false negative) errors, ensuring that unrelated material does not obscure useful content, and that useful content is not accidentally dropped. All reductions in Type I and Type II errors cut transaction costs of using the system and make it more valuable.

The design principles for creating internal knowledge markets outlined in this paper have potential in solving both the knowledge elicitation and validation problems. Consumers may find in the KMS platform high quality contributions and producers are provided with fair incentives in proportion to their contributions. Over the long run recognition by management and visibility within the organization is one of the important dimension to keep the market running as it shows that the organization is serious with knowledge sharing and considers it as one of the behaviors it encourages and supports. Reputation mechanisms enable producers to build a *reputation profile* and provide a way to

overcome imperfections in the knowledge markets. While most electronic marketplaces support some form of reputation mechanism (eBay, Google answers), prior research has largely neglected their potential importance in knowledge markets. Organizations may actively influence reputation to strengthen producers' motivations [21].

For example, organizations can promote desired KM behaviours through targeted communication, such as publicizing the benefits of knowledge consumption, recognizing important contributors, and sharing their stories with employees across the organization.

Running a knowledge market over time implies, consequently, educating producers and consumers on ideal participation behavior. For an internal market to succeed it is not necessary for each individual to earn a profit; the more important goal is for the knowledge market to serve as a mechanism for encouraging knowledge sharing. Both producers and consumers of knowledge will benefit if they use the market not simply for individual economic returns, but as an avenue for dialogue, knowledge exchange, and growth.

6. Conclusion

This article identifies two significant challenges in implementing KMS namely: knowledge *elicitation* and *validation*. It then, employs a knowledge market perspective with economic principles to comprehend the complex dynamics between: knowledge, market players and the KMS platform.

Our analysis uncovers the potential of knowledge markets in solving the problems faced with traditional KM approaches and devise some preliminary steps in designing them. We summarize our propositions as follows:

1. Seed the market with critical knowledge on the most pressing consumer's problems
2. Provide a subsidy to key producers to promote content creation
3. Provide information both and about the market such as consumers' information critical issues and their willingness to pay shares from a fixed budget.
4. Analyze user's interactions with the platform (e.g. feedback and ratings)
5. Update the incentive mechanisms to make the market running over time
6. Maintain knowledge quality and currency

7. Emphasize key behaviors (e.g. influencing reputation)

Future studies may benefit from our attempt to devise some initial steps in designing knowledge markets inside the boundaries of a firm to develop a formal framework for solving the challenges of traditional KM approaches. Admittedly, our contribution is a first step towards designing effective knowledge markets; it remains conceptual in nature. As a further step and natural direction towards developing a design framework for knowledge markets would be to apply our initial design steps to a real case study analysis. Then, the tentative conclusions and theory ideas stemming from the case can be subjected to experimental analysis.

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