

# Knowledge Market Design From The Outside In

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Internal knowledge markets can improve forecasting, innovation, and productivity. But how can executives create, manage and measure their many benefits?

One of the central tenets of the “Wisdom of Crowds” is that companies can't always plan everything from the top. Technological advances now provide workers with more opportunities than ever to join together, freely decide which topics are important, and combine new ideas with old information. Yet, companies still rely on centralized IT repositories and hierarchical planning to manage and distribute information.

If we viewed these companies as economies, they would be analogous to centrally planned markets in which a politburo directs workers' activities across the firm. But the demise of the Soviet economy largely demonstrated the failure of command economies over market economies.

The explanation for this failure is found in the seminal work of economist Friedrich von Hayek<sup>1</sup> on the distributed and tacit nature of knowledge. Arguing for the importance of market economies in 1945, Hayek emphasized that knowledge is unevenly distributed across society, and that centralized economic planning is prone to failure due to an inability to aggregate distributed knowledge and establish accurate prices.

Today, markets have proven their potential as sources of innovation. However, while external markets have been well studied, using market processes for managing information flows inside the boundaries of a single firm has just begun. Firms, ranging from Google to Microsoft and Best Buy to Peugeot, are experimenting with *idea markets* for new product development, *prediction markets* for working business decisions, or *innovation markets* for problem solving. Only a few have started exploring *knowledge markets* for internal knowledge exchange.

Introducing a knowledge market inside the boundaries of a particular firm is no easy task. Creating internal market processes requires adopting market infrastructure – not only systems and technology, but also facilitators who serve as market makers, pricing mechanisms (mediums of exchange) as well as regulation mechanisms to insure fairness. The new infrastructure should harness the self-interest of participants – knowledge producers and consumers – encouraging them to produce and codify knowledge in a form that is accessible to all knowledge-seekers to generate the greatest amount of value.

This article provides a design framework and overview for helping companies launch and sustain knowledge markets. The proposed framework illustrates the life cycle of internal knowledge market development and explains issues to consider at each stage.



## THE LEADING QUESTION

How can managers design internal markets to create, manage and measure information?

## FINDINGS

Internal markets can increase innovation, improve decisions, adapt system functions to user needs, and put a price on information.

Price theory, two-sided network theory, and the quantity theory of money can get you there.

## Knowledge Problems

Managers have long struggled with the challenges of *eliciting* and *validating* useful knowledge and *quantifying* its value (See “Three Challenges”). Experiments to meet these challenges are numerous, yet few have succeeded and most have been abandoned.<sup>2</sup> Today, however, the emergence of web 2.0 technologies such as wikis and market platforms have been suggested as potential means for curing these knowledge problems. But how can managers bring market benefits inside their firms?

*Elicitation* – To get valuable information, executives need to locate experts, collect their varied expertise, and make it available for future use. At the point of launch, Knowledge Management

**THREE CHALLENGES**  
Eliciting and validating knowledge then quantifying its value are challenging questions executives have tried to address for years. Consider these problems and their consequences.

Eliciting	Validating	Quantifying
Locate sources of relevant knowledge	Get people to use or adopt the system	Measure direct content value
Get people to contribute	Gauge relevance & identify obsolete content	Measure effects of applying content
→ System has too little content and few contributors	→ System has low quality content and few users	→ System development based on speculation

Systems (KMS) have no knowledge worthy of sharing. Consumers have nothing to consume or to value. And producers are better off sharing directly with grateful colleagues rather than codifying their expertise. Converting knowledge to a public good also undermines incentives to codify and share it from the start. When sharing does occur, it is often serendipitous. For example, AECOM, one of the world's largest engineering firms, produced sugar dust as a byproduct of processing biofuels in Argentina. Sugar dust is explosive, and hazardous around fuel. The team addressing this problem was located in

London but got lucky when a bulletin board post turned up a solution from an expert in Australia. Luck, however, is an unreliable way of locating expertise.

### Validation

Once created, content stored in the repository should be accessible and reuseable by other individuals within the firm. Managers must therefore pay careful attention to the continuous process of verifying, updating, upgrading, and adapting content to the consumer's needs. 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. The problem is that the “transaction costs” of locating what is needed, correcting for errors of omission and commission, and verifying value all reduce the utility of the system to the point where users will avoid using it.

### Quantification

As an intangible asset, knowledge is hard to value. Classical techniques (e.g., cost-benefit analysis, statistical estimation) have proven inadequate as they focus on cost-avoidance rather than value creation. The resulting dilemma is that while KMS come with a clear price tag, the benefits – better informed employees, streamlined communication with customers, new products, repeatable and consistent processes – often do not. Most organizations we studied failed to develop concrete measures of information value. One exception, IBM, combines measures at different levels of analysis to assess the real value generated: a quarterly assessment

of knowledge object reuse (assets and methods), employee and client surveys, problems solved, and potential areas of improvement.

To help managers bring market benefits inside their firm and address these problems, we build on three economic theories (See “Three Theories and Their Potential for Internal Knowledge Markets (IKM) Design). These theories can support launch and develop the IKM, supply quality information, and manage growth in the firm’s internal knowledge economy.

## Types and Design Elements of Internal Markets

Fueled by better forecasting, decision-making, innovation, and knowledge management internal markets have been adopted recently in a wide range of firms (See exhibit “Types of Internal Markets”). At one end of the spectrum are prediction markets that deal with news, and

### THREE ECONOMIC THEORIES AND THEIR POTENTIAL FOR IKM DESIGN

**Two-Sided Market Theory** describes how to promote adoption of a technology standard and stimulate third-party development by subsidizing user/developer networks.<sup>3</sup> For knowledge management, this tells us how to get users to adopt a new system and how to subsidize content creation and content consumption so employees themselves add continuous value.

**Price Theory** describes how markets efficiently allocate resources across an entire economy using only private information. It also tells how markets supply missing goods.<sup>4</sup> For knowledge management, this is critical in getting people to produce valuable knowledge for others but only when this is more valuable than what they’re already doing. It can also tell us how to value intangibles.

**Quantity Theory of Money** describes how to manage a supply of value -- money, credit, and points -- to achieve economic vitality and growth by choosing expansionary or contractionary policies.<sup>5</sup> For knowledge management, this tells us how to stimulate and how to regulate trade volume in our firm’s internal knowledge economy.

expectations about a range of outcomes such as company worth, election victories, or popular fashion. Hewlett Packard has used them to forecast sales, Eli Lilly to predict drug success, and Best Buy to gauge store opening dates. At the other end of the spectrum are idea and innovation markets. These serve to generate new ideas, develop new methods and designs, and find solutions to unsolved problems. IBM held its first "innovation jam" among employees in 2001 and opened to the public in 2006, putting \$100 million behind the best proposals. General Electric uses an idea market to generate and select ideas on emerging technologies. Knowledge markets occupy a middle ground. They are questions and answers systems connecting knowledge sources. Mitsubishi bank uses a knowledge market, to help clarify policy directives, customer management, and bank law issues. Innocentive (the leading innovation marketplace) has recently released Innocentive@work, a version of its market software for firms to use in internal settings to promote knowledge exchange. While executives tend to recognize the power of knowledge markets, implementation is often tricky. Because internal knowledge markets contrast starkly with traditional knowledge management (see “Traditional KM Versus Internal Knowledge Markets”), executives who want to

incorporate market processes inside their firms need to consider fundamentally different design principles. From our research, we identified three critical dimensions that executives need to manage: (1) access to novel information (2) incentives to offer participants, and (3) alternative roles of governance.

## 1. Managing Uncertainty and Access:

Typical KMS treat knowledge needs as if they were predictable. In this top-down approach, a central authority prioritizes development to address mainstream problems.<sup>6</sup> But, KMS can contain only *historical* facts. They cannot contain news or solutions for issues that have not occurred. The banking crisis of 2008 brought into sharp relief problems whose answers did not yet exist. Traditional approaches can therefore address only a small fraction of the “market”—a small group of workers with defined and focused problems.

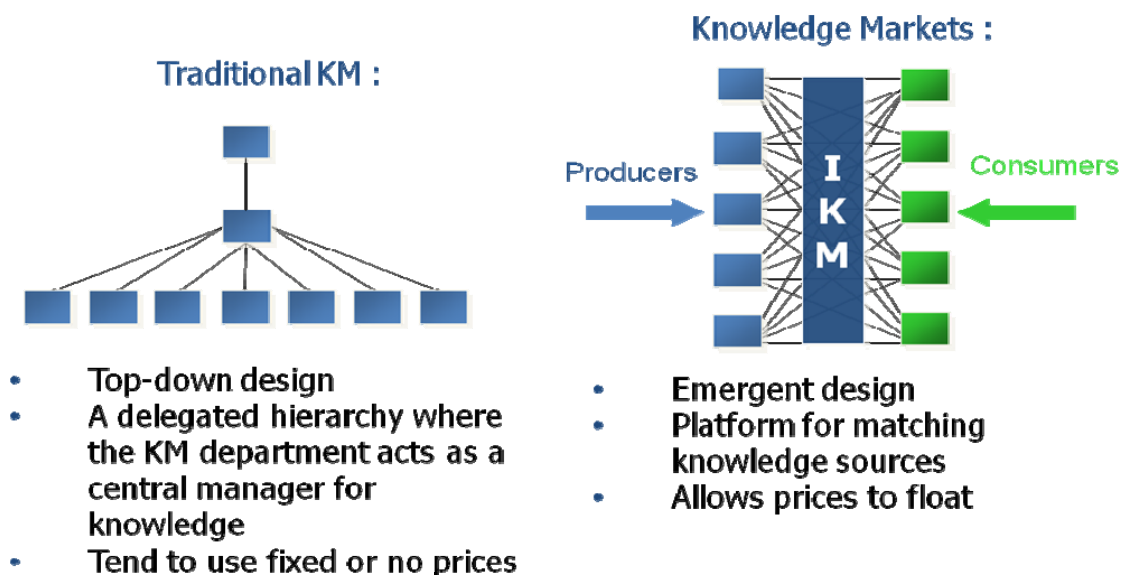
Not surprisingly, this produces mixed results. One audit and consulting firm we studied spent almost three years codifying best practices and making them available through its KMS. Yet, when the system was introduced to more than 1500 consultants, only 130 of them claimed to find useful content.

A better approach is the information equivalent of just-in-time inventory. Offer a platform that helps people pull what they need when they need it. Meeting unanticipated needs implies providing access to a broader range of information, not just local fiefdoms, and it means providing access to experts. Ultimately, this implies matching knowledge sources.

Regulating access then hinges on a choice of fee versus free. Fee-based knowledge markets, such as Experts-Exchange (computer and IT) and BitWine (diet, health, stress, etc.) charge for access to pre-screened experts. Google Answers (general Q&A) allowed users to post questions along with how much they would pay for answers. Exceptional solutions might also receive bonuses. When this site closed in 2006, experts from this site launched Uclue, a fee-based market currently in operation.

In contrast free services like Yahoo! Answers allow anyone to participate. Experts and novices alike can offer answers, advice, and commentary. Quality varies widely and Yahoo! does not distinguish among correct answers, incorrect answers and opinions. Sermo, another free knowledge market, restricts participation to doctors and registered nurses. For useful advice, participants receive a share of any new medical practice income or patents that result.

### Traditional KM Versus internal knowledge markets



## 2. Offering Flexible Participant Incentives

Another problem of prior KM approaches is that firms have used fixed rewards. When prices are fixed, information that is more valuable than the price *is not* created -- experts won't waste their time -- while information that is less valuable than the price *is* created -- novices comment just to get paid. So, consumers often find the system contains inessential or inapplicable content.

Consider the following HP and Siemens examples. To motivate knowledge supply and demand, HP established an incentive program based on frequent flyer miles. Posting a useful resource earned 2,000 miles, posting a question earned 1,000 miles, and posting an answer earned 500 miles. But 90 days after launch, the program had reached little more than 20% of the target audience. Siemens, similarly, relied on “shares” participants could redeem for prizes. Contributing solutions and success stories earned 20 shares while developing customer, technology or market bids earned 10 shares. This program significantly increased contributions; nevertheless information quality remained poor.

### Price theory for elicitation and validation



Most firms recognize the need for incentives. But, like most central planners, they fail to recognize the need to vary prices on information of varying importance. We know from basic demand and supply economics that efficiency requires prices to adjust (See “Price Theory for Knowledge Elicitation and Validation”). If price is too low, then critical information will be undersupplied. Conversely, if price is too high, not only does the firm overspend, the excessive price diverts contributors from other value adding activities.

*The solution is to let prices float based on supply and demand; higher offers should call forth resources with greater value.*

## 3. Redefining Governance

The third element is to consider not just how executives change their people and tools but also how they change themselves. To run the company effectively, do they accept verdicts of their market? The true test of internal market adoption is whether firms use them for critical issues, not just fringe areas. When people pose better questions and post better answers, does the IKM empower them to influence firm choices?

Executives must support the change in power that follows from a change in the sources of expertise. In one Pacific Rim bank we studied, over 90% of questions travelled up from field



offices to headquarters while answers travelled down in the opposite direction. Tapping expertise only vertically misses the full benefits of openness. Truly democratizing knowledge requires an open organization where employees can deliberate, argue, vote, compete, and collaborate horizontally across fields of expertise.

An internal market opens the firm to new forms of governance and creates completely new roles for those who would manage expertise. These roles are *market maker* and *Federal Reserve*. In neither role, does the KM department behave like a central planner. Rather, as market maker, it steps in to provide liquidity when market participants have failed to match, lack information, or time to provide it. As Federal Reserve, the KM department manages the internal economy for optimal growth. Most departments have no idea how to perform these roles. But, they are crucial to bringing markets inside the firm.

*Managing an internal knowledge market will alter the role of the KM function in ways that traditional firms do not currently understand.*

## **A Design Framework for Internal Knowledge Markets**

Here, our objective is to provide executives with a blueprint for identifying key design features, and making knowledge markets work.

### **Phase 1: Market Launch**

*Seed & Subsidize to Match Content Providers with Content Consumers*

Markets require critical mass. Internal knowledge markets also require specialized content, produced by autonomous distributed contributors, and consumed by autonomous distributed users. But attracting and matching these two distinct groups remains tricky. It implies a high quality pairing between an information have and an information have-not.

In external markets, this problem has been solved, and recently formalized as the Theory of Two-sided Networks. Two-sided Networks are matching markets where distinct groups or networks provide each other with mutual benefits. Examples include buyers and sellers on E-Bay, job seekers and employers on Monster.com, and listeners and musicians on iTunes. Successful market launch of two-sided networks relies on two important strategies, *seed and subsidize*. These can easily be understood using language of the "Long Tail".<sup>7</sup>

If you sort the content available for any platform on the basis of popularity, the "seed" is the most important content at the head of the distribution. To launch a market, the platform sponsor's first step is to seed it with popular content. RCA used this strategy to launch color TV in the time of black-and-white by having Disney produce glamorous color programs. Similarly, Apple's iPhone comes preloaded with several of the most important mobile applications.

The second step requires obtaining content for the long tail. Platform sponsors typically lack resources and even the know-how to produce all the specialty content consumers demand. So the platform sponsor subsidizes producers by offering appropriate incentives. Take, for example, Microsoft. To promote Windows and Xbox, Microsoft gives developers system development toolkits, API hooks, and extensive software support. The analogy for a knowledge market is to first seed critical knowledge on the most pressing employee problems, introducing a hook that stimulates consumer adoption. Siemens used this strategy to promote adoption of Sharenet. The knowledge market sponsor then provides subsidies and benefits that exceed contributor opportunity costs of codifying knowledge. Thus, while the KM department manages key resources at the head of the distribution, the whole employee population becomes part of the process for creating knowledge objects out on the long tail.

Types of Internal Markets	Rationale & Application	Advantages	Platforms & Experiments
<b>Prediction Markets</b> (Forecasting)	<p>Prediction Markets are speculative markets for forecasting uncertain events and trading contracts that yield payments based on the outcome of those events.</p> <p><i>Application:</i> supply chain management, business forecasting, new product development, policy analysis, and sports betting.</p>	<p>1. Improve decisions: help businesses make better investments decisions, help governments make better fiscal and monetary policy decisions.</p> <p>2. Provide forecasts on a wide range of events, from presidential elections to printer sales.</p>	<p><i>Platforms:</i> Intrade, Inkling, Consensus Point, News, The Iowa Electronic Markets, Foresight Exchange, NewsFutures.com's Hollywood Stock Exchange, TradeSports</p> <p><i>Firm experiments:</i> Eli Lilly, GE, Google, France Telecom, Hewlett-Packard, IBM, Intel, Microsoft, Siemens, Yahoo, Best Buy, Masterfoods, Siemens, Arcelor Mittal, Renault</p>
	<p>Knowledge markets act as intermediaries between knowledge seekers and holders. They have been used to connect experienced, researchers and engineers with member companies for short-term assignments, or to match knowledge sources inside a firm.</p> <p><i>Application:</i> knowledge management</p>	<p>1. Match knowledge sources (Consumers &amp; Producers).</p> <p>2. Connect knowledge seekers to experts.</p>	<p><i>Platforms:</i> YourEncore, Yet2.com, ExpertsExchange, Knee.com, Knexa.com, Google Answers, Sermo, Uclue, JustAnswer, Mahalo Answers, SDN.</p> <p><i>Firm experiments:</i> Eli Lilly, McKinsey, SAP.</p>
<b>Innovation Markets</b> (Problem-solving)	<p>Markets for R&amp;D problem solving, they act as "brokers" who bring together a problem solution seeker with a global network of problem solvers.</p> <p><i>Application:</i> research and development</p>	<p>1. Bring companies with specific R&amp;D problems together with researchers and problem solvers around the world.</p> <p>2. Save time and money for customers by providing them access to qualified researchers without having them on their payrolls.</p>	<p><i>Platforms:</i> Innocentive, NineSigma.</p> <p><i>Firm experiments:</i> Eli Lilly, SAP.</p>
	<p>Markets enabling the search for outside ideas to develop products faster, without having to do everything in-house, but instead leveraging the skills and knowledge of others.</p> <p><i>Application:</i> design, new product development</p>	<p>1. Involve users in idea generation; submit ideas for innovative electronic products.</p> <p>2. Involve organizational members in the activities of idea generation and selection of new services, products and processes</p>	<p><i>Platforms:</i> Crowdspirit, IdeaMagnet, IdeaConnection, Salesforce.com's Idea Exchange, IBM innovation jam.</p> <p><i>Firm experiments:</i> Threadless, GE, Peugeot, Lego, Salesforce, IBM.</p>
<b>Idea Markets</b> (Product development)			

### *Introduce Transferable and Culturally Appropriate Incentives*

To enable participants to exchange value, markets require a medium of exchange. Rather than rely solely on a fixed reward or rating system, firms have begun adding virtual currencies to trigger quality content. These offer major advantages over ratings alone. First, virtual currencies are unbounded and transferable whereas ratings are bounded and non-transferable. Positive ratings on EBay exceed 98%. Bounded and bunched data lose much of their decision value. Also, users cannot spend ratings. Imagine trading on EBay with no posted prices, and exchanges that can only involve bartered goods. Currencies lubricate trade. Participants in Newsfutures' prediction market can use their virtual earnings to buy items from an online auction. Linden Labs, creator of the virtual world "Second Life," has issued virtual Linden-dollars that can be converted into real U.S. dollars or spent on goods and services that confer advantages inside the virtual world. For internal markets, virtual currencies cost less than real money and evidence suggests they are also very good at promoting participation and providing accurate information.<sup>8</sup>

Second, virtual currencies promote the best use of everyone's time. Because the person who needs help must work within a limited budget, he or she is forced to make choices about what is less and what is more important. This encourages even that lazy employee to go check the database of Frequently Asked Questions (FAQ) before re-posting questions that have already been answered. Meanwhile, posting a question worth 5 points won't divert executive attention from midlevel tasks while posting one worth 5000 points probably will. Resource balance is the essence of price theory. Each person, acting on his or her own private information, allocates time efficiently for themselves and for others. What's important or critical immediately gets flagged as important or critical – a benefit missing from ratings that are supplied after the fact.

Of course, people have different motives<sup>9</sup> and incentives must be culturally appropriate. In life, when someone provides a service, an age-old question is whether to return a fee or a favor, a tip or just a "thank you." The closer the provider is to being a friend, the more appropriate is reciprocal help or a thank you. The closer the provider is to being a professional, the more appropriate is a tip or a fee. Small organizations can get most of the information sharing they need through cultural norms and generalized reciprocity although they lose the benefits of a pricing system for resource allocation and value estimation. Big organizations need currencies. Even here, however, "currency" can be any social benefit that people value. Time banks, for example, rely on a time-based currency to exchange services where the unit of exchange is the person-hour. SAP has developed an innovative point system for its developer community. Originally, developers earned individual awards such as t-shirts and memorabilia for points earned trouble-shooting, blogging, and answering each other's questions. In 2008, the community wanted something more valuable and socially responsible so, based on their input, SAP offered charitable donations of €100,000 if the community could collectively generate 2.5 million points. The community rallied to a stretch goal of 3.5 million points, and SAP doubled its offer, sponsoring €200,000 worth of children's education and health care through the United Nations. Throughout, in addition to the group-based incentives, SAP continues to offer special recognition to its highest point generating individual developers and business process experts, and consults with them on policies and product design – a clear win for everyone involved.

## **Phase 2: Market Development**

### *Manage Inflows for Growth*

To chart the best path to stable knowledge markets and more productive workers, we borrow from more than a century's experience in real world economies based on the Quantity Theory of



Money. So, how does this theory help us grow our internal knowledge economy? The size of the currency supply gives us a new control lever that we can manipulate guided by the tenets of monetary and fiscal policies.

An expansionary monetary policy grows the knowledge base. That is, to promote knowledge consumption, the internal Federal Reserve should expand the money supply. This is easily achieved by issuing extra points to market participants. A rule of thumb is to give people points in proportion to sources of value, for example, to add them relative to a job class, salary, or project workload.<sup>10</sup> Total inflow volume should occur at a rate proportional to company benefits from creating new information. The goal is to keep prices stable while gradually expanding the point supply. Expanding the point supply stimulates transactions volume. In our internal knowledge economy, this increases the number of questions answered, the number of information resources traded, and the number of platform services provided. Either, the CIO, the COO, or the CFO gains control over a powerful new tool for boosting knowledge worker productivity.

Fiscal policy can be used for targeted stimulus spending. SAP implemented a virtual fiscal policy when it temporarily offered developers double points, a budgeted subsidy, for knowledge market activity relating to its new CRM products. Exactly as predicted by Two-Sided Network Theory, this boosted "long tail" development of CRM content that SAP itself did not have to provide.

#### *Manage Outflows for Stability*

These powerful growth and policy tools can be easily misused. The CFO or CIO might find it tempting to flood the market with points in ever expanding pursuit of productivity. This would be unwise as it leads to clear parallels with economic inflation and instability. Points devalue when question prices rise. The solution is also obvious. Just as the Federal Reserve implements a contractionary policy to curb inflation, the knowledge market maker can conduct open market operations – such as offering services or buying points that shrink the point supply – if expansion has gone too far. These real costs force real self-discipline on a market maker that abuses its power. Linden Labs passes points to its economy through a system of sources and sinks, and even buys and sells its own virtual currency.<sup>11</sup> Sources, which increase the point supply, reward participants for desirable activities like joining (newbies have access to literal money trees) or upgrading to premium services. Sinks, which decrease the supply, represent fees for activities like renting land or converting virtual money back into real.

The preferred balance has inflows slightly exceeding outflows so the internal knowledge economy expands gradually and points retain constant value. Outflows occur as participants redeem points they have earned. Their acquired points become convertible into services, gift vouchers, new answers, or other claims on firm resources. Participants can decide to spend them immediately or decide to accumulate more points to accrue benefits later or change their status. The online knowledge market, Mahalo Answers, for example, lets members earn points for answering questions, giving, or receiving tips. As participants accumulate points, they can spend them or progress through different belt levels (white, yellow, green, etc.) to be recognized as experts. The higher the belt level (e.g., 4<sup>th</sup> degree Black belt), the more expert is the participant. Points can also expire to encourage greater knowledge market spending, but the system should continuously display earned point totals as a continuing incentive to build reputations.

### **Phase 3: Market Evolution**

#### *Design for Self-Design*

Competitors, markets, and systems evolve and knowledge markets should be no exception.

Even if the internal knowledge market responds to existing participant needs, those needs can change. Indeed, as users grow more competent, they can see new opportunities and dream up new things to do with their tools. Markets provide missing goods. They adapt to changing conditions, especially those not anticipated in any central design.<sup>12</sup>

Suppose a VP wants a specific chart to organize his system data. He can offer points to have it provided. Then any of several things can happen. If more senior executives (or even less), realize the value of this chart, they can supplement his original offer to have it provided sooner. If another executive has a similar chart, she can provide it immediately and claim the points offered. If the chart is unavailable and the IT department must provide it, the programmers no longer need to guess which features matter most. Points offered automatically indicate which features provide the greatest value to the organization as a whole. If the IT department is tied up, it can provide extra liquidity via point supplements so skilled users themselves provide this feature.

Departing from a centralized hierarchy offers a huge win in terms of adaptability. An experiment run by Princeton's student government shows the benefits of internal markets. In trying to decide how to spend student government resources, they generated as many ideas as possible, which they submitted to a vote. But, they used an innovative quasi market that allowed students to submit new ideas. The result? Not only did the elected officials misjudge several of the students' priorities, but also two of the top five items were not on the original list!<sup>13</sup>

Markets are powerful tools not only for generating new ideas but also for assessing their rank. But the benefits of markets go deeper than providing missing features they also solve the problem of inflexible taxonomies.

Consider the mismatch that always occurs between data represented in a person's head and that represented in a database. If a novice searches the database using the wrong words and no answers appears, the knowledge market can either connect the seeker to an old answer or provide a new answer. Then the next time anyone makes the same mistake, the answer is ready at hand. Whatever the best representation for users, that's the one the knowledge market quickly provides. The mental map of the system adapts to match the mental maps of employees – not the other way round.

### *Quantify Value*

Internal markets provide executives with two instruments to solve the problem of measuring knowledge value. First, crossing supply and demand curves from the knowledge market can be used to estimate the value of information directly. The balance of these forces, exactly as in Figure 2, provides a single trading value. Understanding the exchange rate between points and dollars gives us an immediate estimate for the value of information. This puts a price on a knowledge object. This starting price, however, will necessarily be an underestimate because information can be reused costlessly by more than one person. Its value to the whole organization should be higher. Tracking re-usage statistics enables managers to impute a full demand curve. Mathematically summing the area under the demand curve then gives an approximation for the full value of a knowledge object to the organization.

Second, an internal knowledge market provides us with another instrument to observe not just prices but also the effects of having access to new information. The operating hypothesis of most IT systems is that access to newer and more accurate information boosts productivity. For any knowledge worker whose output can be quantified, as is the case for sales, marketing, coding, medicine, law, consulting, and most forms of project work, we can measure the indirect effects on productivity. Among executive recruiters, for example, we measured white collar output at \$2,150/day!<sup>14</sup> Since we can observe productivity before and after introduction of the market, we

can see if we observe a delta. How much does access to a more diverse array of knowledge objects result in an increase in output? The fine grain detail of measured access, measured contributions, measured sharing, and measured output provides new ways to put a price on knowledge.

### **Key design challenges**

Powerful new tools can come with interesting new challenges. Executives need to think through two important issues when designing internal knowledge markets.

#### *Manipulation*

Failures can occur when participants manipulate markets to their own ends. When the Schaumburg Flyers, a minor league baseball team opened their coaching decisions to popular vote, performance was disappointing. Unfortunately, fans on opposing teams also got to vote.<sup>15</sup> Internal markets generally suffer less from manipulation than external markets. First, their existence within the same firm encourages goal alignment and permits disputes to be easily bumped up to higher management rather than going through the courts. Second, gains from shilling ideas in the internal knowledge market are likely dwarfed by salary consequences from bad advice. Finally, identities in knowledge markets tend to be discernable making long term reputation much more important than short term gain. Regardless, the solution is to identify and discourage voting and advice-giving in cases of a conflict of interest.

#### *Social Substitution*

One concern arising from the use of currency for information exchange is that prices can sometimes have perverse effects on peoples' contributions, ranging from reducing volunteerism to selling.<sup>16</sup> To compensate for these effects, organizations can design the internal knowledge market to foster pro-social behavior. Design features can explicitly encourage norms such as helping, sharing, and cooperation. For example, the system can offer special recognition to generous information givers. If someone is unusually helpful, the system should allow questioners to give thank you points either directly to the answerer or to a charity in an effort to give this person extra recognition. Another design element is to let the answering party waive her claim on points or designate them to some other purpose she values. People who are generous in waiving their points can also get special recognition. This recaptures some of the psychological benefits of just doing the right thing without getting paid.

Another design feature is to support the formation of "identity-based" groups, that is teams that self organize around a common skill, desire, or purpose. When such voluntary groups assemble, they are especially good at information sharing and seeking, managing turnover, and achieving identity-based goals. Using social psychology techniques<sup>17</sup> has been shown to increase contributions in online communities.

A final design element is to allow the seeker or the solver to designate the question or response as private or anonymous. This encourages people to volunteer controversial information they would not otherwise share, or admit to ignorance they would not otherwise reveal. This clearly helps organizations capture new information it will not be doing otherwise.

### **Conclusion**

Through internal markets, executives can get better forecasts, develop new products, and boost productivity. Markets can self-adapt to employee needs and help balance the best use of everyone's time. Introducing such markets, however, depends on shifting executive mindset from

central planning to market making. To succeed, we offer a blueprint grounded in established economics. Knowledge market launch requires the market maker to seed-and-subsidize in order to provide critical mass for market germination and to match knowledge seekers with relevant sources. Sustaining the market implies that liquidity inflows should balance and slightly exceed outflows in order grow knowledge transactions. Targets can follow growth practices exactly like those of the Federal Reserve. To quantify value, track internal points trading while letting prices float. Market pricing will reveal information value and measures of productivity. The result is a powerful set of tools for managing investments, innovation, and growth.

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