Collective Innovation

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Abstract:

The ability to innovate sits at the heart of an organization's ability to succeed in a competitive environment. An organization can innovate by improving existing products, services, or processes or by generating new products, services, or processes. Achieving successful, repeated organizational innovation, however, is a significant challenge. The hurdles to such innovation run the gamut from psychological to structural to procedural. Managers can fall victim to myopia and other human level challenges. Organizational processes, structures, and values can short circuit innovation as well. Given these challenges, we posit that an innovation strategy embracing the concepts of collective intelligence and openness may enable organizations to surmount these hurdles. We refer to this approach as *Collective Innovation* and define it as a connected, open, and collaborative process that generates, develops, prioritizes, and executes new ideas.

To develop our argument, we surveyed literature from a wide array of disciplines including economics, organizational behavior, social psychology, and organizational change. We begin this thesis by drawing a connection between the economic theories of Adam Smith and Ronald Coase and research into the changing workplace by Thomas Malone. We then introduce the concepts of collective intelligence and openness, core tenets of *Collective Innovation*. After introducing *Collective Innovation*, we examine its place in the history of innovation strategy. Next, we outline and describe the four stages of the *Collective Innovation* process. Having dealt mainly in theory, we then turn to the application of *Collective Innovation* and the myriad challenges that managers will face when attempting to implement such a strategy. Keeping in mind these challenges, we outline four ways in which organizations might use *Collective Innovation* to power the exploration-side of their operations. Finally, we revisit several remaining questions before concluding our analysis.

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Preface

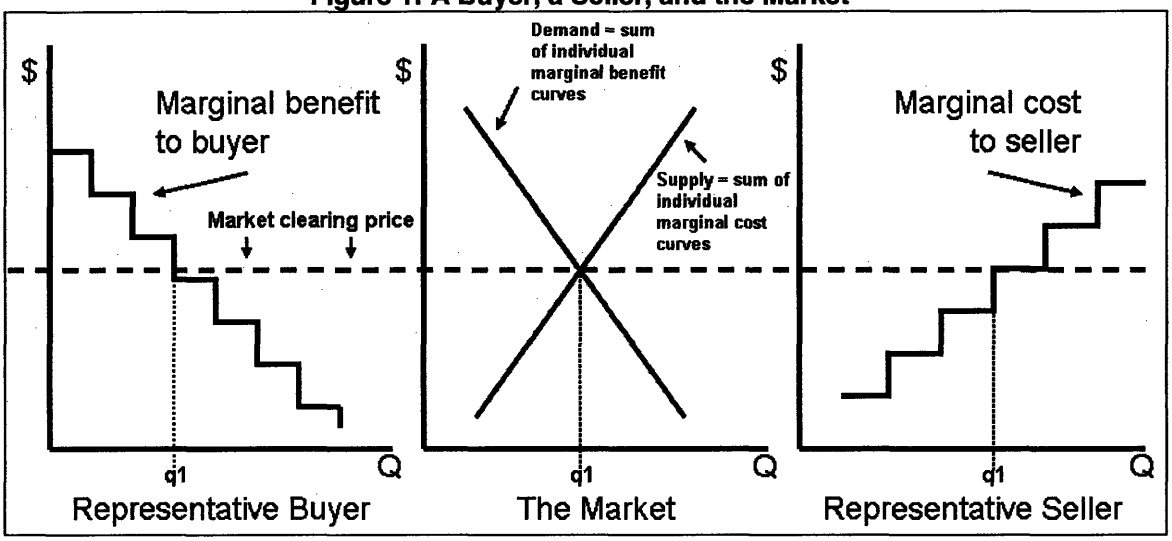
> As every individual, therefore, endeavours as much as he can both to employ his capital in the support of domestic industry, and so to direct that industry that its produce may be of the greatest value; every individual necessarily labours to render the annual revenue of the society as great as he can. He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.[1]

In 1776, Adam Smith published *An Inquiry into the Nature and Causes of the Wealth of Nations*. Within *The Wealth of Nations*, as the work became known, Smith offered an assessment of the power and efficiency of free markets. As noted in the excerpt above, Smith suggests that a free market of individuals acting their own interest will automatically compensate for the actions of those individuals. Since a free market is defined as a market where supply and demand alone determine prices, if demand for a particular product or service rises and supply does not rise to the same extent, the price for that product or service will increase. As a result of the price increase, individual demand for the product or service will eventually decrease and the market will re-balance.

Alternatively, if demand for a particular product or service decreases and supply remains unchanged, the price of that product or service will decrease. The decrease in price will eventually result in a similar decrease in the number of suppliers providing the product or service and the overall supply will decrease as well. With fewer suppliers, and thus a lower supply, the price for the product or service will increase and the market will re-balance. Above all else, free markets ensure that supply, demand, and price remain balanced. As Smith and

'laissez-faire' economists later argued, free markets should be the most efficient method for exchanging goods and services. Figure 1 illustrates how buyers and sellers, both acting in their own best interest, create a market outcome most optimal to both.

Figure 1: A Buyer, a Seller, and the Market[2]



In 1937, Ronald Coase published *The Nature of the Firm*, an article in the journal Economica. In *The Nature of the Firm*, Coase addresses the concept of 'firms' and wonders, if free markets, as presented by Smith, are efficient, why firms exist in the first place:

> As D. H. Robertson points out, we find "islands of conscious power in this ocean of unconscious co-operation like lumps of butter coagulating in a pail of buttermilk." But in view of the fact that it is usually argued that co-ordination will be done by the price mechanism, why is such organisation necessary? Why are there these "islands of conscious power"? Outside the firm, price movements direct production, which is co-ordinated through a series of exchange transactions on the market. Within a firm, these market transactions are eliminated and in place of the complicated market structure with exchange transactions is substituted the entrepreneur-co-ordinator, who directs production. It is clear that these are alternative methods of co-ordinating production. Yet, having regard to the fact that if production is regulated by price movements, production could be carried on without any organisation at all, well might we ask, why is there any organisation?[3]

In essence, if a free market is completely efficient, one should always be able to conduct business most cheaply by outsourcing. To this point, Coase explains:

> The main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism.... that the operation of a market costs something and by forming an organisation and allowing some authority (an "entrepreneur") to direct the resources, certain marketing costs are saved. The entrepreneur has to carry out his function at less cost, taking into account the fact that he may get factors of production at a lower price than the market transactions which he supersedes, because it is always possible to revert to the open market if he fails to do this.[4]

While a free market may be efficient, Coase suggests that there are 'costs' inherent in the market, costs absorbed by buyers and sellers in addition to the price at which the good or service clears. These costs include those incurred in the balancing of the market itself, such as the cost of communication, of sharing information, and of trying to find goods or services.[5] Given these costs, Coase argues that firms are formed because it is more efficient and less expensive to complete certain tasks internally, rather than outsource them to the market and incur added cost.

Consider a firm outsourcing functions such as accounting, human resources, marketing, sales, and research and development. If a free market exists for those functions and the market is truly efficient, than according to Smith's treatise, it would be less expensive to let the market set the price at which those functions clear and thus, there would be no reason to create a firm with those functions in-house. In essence, such a reality would be dominated by individuals, connected by contracts, forming and disbanding on an ad-hoc basis.

Coase's analysis, however, identifies some of the reasons why this reality does not exist. In order for these functions to perform well, interdependencies must exist between each function and the rest of the organization (i.e. the marketing function must be closely tied to the product function, which must be closely tied to the research and development function). In a traditional, integrated firm, these functions are closely interrelated and can only operate as such. Were these functions to be outsourced, the amount of information that would need to be exchanged on a regular basis for those functions to operate efficiently and successfully would be significant. While specific applications, such as salesforce automation (SFA) and employee resource planning (ERP) can be outsourced, it is quite difficult to completely outsource core support functions efficiently, affordably, and successfully. In this book, *The Future of Work*, Thomas Malone builds upon this logic:

> As usual, many factors contributed to the rise of large, centralized organizations. The two most important, though, are the same ones that d rove the shift to centralized governments: the declining costs of communication and the benefits of bigness...The benefits of bigness, in this case, often came through the economies of scale enabled by the new technologies of mass production. As Chandler puts it, "a single set of workers using a single set of facilities [could] handle a much greater number of transactions within a specific period than the same number of workers could if they had been scattered in many separate small facilities.[6]

Malone explains that rise of firms and in particular, the growth in the size of firms, came as a direct result of the economies of scale and scope to be gained from an interdependent system of closely linked functions. Of particular significance, Malone makes the point that decreasing communication costs were essential to the rise of firms, particularly large firms: "To sell their mass-produced products, firms like Ford's needed much larger markets, which in turn required much tighter coordination of business activities. This coordination would not have been possible without the new communication and transportation technologies of the railroad, the

telegraph, and, eventually the telephone."[7]Malone also argues that organizations will continue to grow as the decreasing cost of communication enables them to pull functions into an ever-expanding global web. At some point, however, Malone suggests that:

> ...eventually, further decreases in communication costs should lead to increasing decentralization...Information technology is relentlessly pushing down communication costs, enabling companies to decentralize without sacrificing scale economies. And the increasing importance of knowledge work makes motivation, creativity, and flexibility more important than ever. Does this mean that everything will become decentralized? Of course not. Centralized structures will continue to make sense where the benefits of smallness are insignificant relative to the benefits of bigness, or where there's just no way to get enough of the benefits of bigness in a decentralized system.[8]

For decades, research and development and indeed, organizational efforts to innovate, have largely existed in the realm of the closed, the centralized. Research and development continues to exist as a function whose successful operation has necessitated a tight relationship with a variety of other functions within the organization. While the decreasing cost of communication has enabled organizations to create far-flung research and development laboratories, it has also enabled organizations to further centralize their overall research and development effort. Furthermore, research and development itself has remained somewhat closed to the rest of the organization and virtually sealed off from the outside world.

This thesis asserts that the decreasing cost of communication positions the organizational innovation process, from idea creation and development to idea prioritization and resource allocation, perfectly for increased decentralization. Consider Coase's identification of costs inherent to the market and the suggestion that, where such costs to reduce to zero, a decentralized, free market strategy would obviate the need for centralization and firms. As the costs of communication and collaboration reduce to zero, this paper suggests that a

decentralized approach to organizational innovation will perform better than a centralized approach.

Specifically, the decreasing cost of communications enable organizations to leverage the power of what is known as collective intelligence throughout this innovation process, avoiding many of the challenges that organizations have traditionally faced while trying to innovate successfully and repeatedly. Indeed, the evolution of technology and the Internet now make it possible to supplement the strengths of decentralization with the power of collaboration and tacit knowledge. We have termed this strategy *Collective Innovation*. Today, organizations are implementing *Collective Innovation* at individual stages within the innovation process, but no organization has yet implemented *Collective Innovation* across all stages of its innovation process. This thesis explains why we think this is a good idea.

[1] Smith, A., & Cannan, E. (2003). *The Wealth of Nations.* New York: Bantam Classic. p. 572
[2] http://www.ingrimayne.com/econ/optional/effic/EfficiencyMark.html (Accessed 2:27pm, 3/26/07)
[3] Coase, R. H. (1937). The nature of the firm. *Economica, 4*(16), p. 388
[4] Ibid., p. 392
[5] Ibid., p. 390
[6] Malone, T., (2004). *The Future of Work.* Boston: Harvard Business School Press. pp. 29-30
[7] Ibid., p. 30
[8] Ibid., p. 36

Chapter One: Introduction

'How much does that trash can weigh?'

You're sitting around with some friends and you spot a trash can nearby. You wonder, how much does that trash can actually weigh?

You observe that the trash can is made out of plastic, has a lid on it, is a little larger than your trash can at home, and looks full. You estimate, therefore, that this trash can is a bit heavier than the trash can you have it home, based upon your experience moving it to the curb for trash pickup the day before. When you lift your trash can at home, you feel that it takes the same amount of effort to lift as the 50 pound barbell you use to exercise. You therefore estimate that the trash can weighs approximately 48 pounds.

You turn to your friend and ask her how much she thinks the trash can weighs, without revealing your own estimate or your thought process to reach your answer. Your friend has a background in materials science and once worked in a plastics research laboratory during college. Taking a look at the trash can, your friend thinks back to her research experience and compares her visual observations of the trash can's construction with the work she performed in college. Considering the amount of plastic used, its density, as well as the paint and sealant applied, she finally considers what its contents might be and how much those contents might way. Your friend then estimates that the trash can weighs approximately 40 pounds.

Your friend turns to another member of the group and again, without revealing her own estimate or thought process to reach the answer, asks this third friend how much he thinks the trash can weighs. The third friend glances across the trash can and thinks back to the summers he spent as part of a landscaping crew. During those summers, much of his time was spent

collecting together grass trimmings, leaf clippings, and other yard refuse for disposal. He often placed the refuse in large barrels, much larger than the trash can in question. Thinking back to the size and weight of those large barrels, he considers the trash can in question, makes some adjustment for the smaller scale, and estimates that the trash can weighs approximately 60 pounds.

The remaining three members of the group are queried, each time without revealing any of the previous estimates or thought processes. The fourth friend considers how full the trash can appeared when he placed some papers in it two hours earlier and guesses 42 pounds. The fifth friend remembers jostling the trash can a few weeks earlier while in a crowd of people and bases her estimate on the impact she felt - 57 pounds, she estimates. The sixth friend makes a quick visual estimate of the trash can's volume, considers the usual garbage that might be deposited in the trash can, and then estimates the weight of that garbage, adding 20 pounds for the weight of the trash can itself and coming up with 65 pounds.

The estimates of each member of the group are then shared: 48, 40, 60, 42, 57, and 65 pounds for a mean of: 52 pounds. A careful weighing of the trash can reveals an actual weight of: 53 pounds. This is the power of collective intelligence.

'Why can't we innovate?'

Organizations are formed to achieve a specific goal and must develop a strategy that dictates the steps that the organization should take to reach that goal. The strategy must take into account the firm's own organizational foundation - its own resources, processes, and values - as well as the external environment that surrounds the organization, including buyers, suppliers, entrants, substitutes, and rivals, as well as social, political, and economic factors.[1] Ultimately, how well the organization performs depends upon the soundness of this strategy,

how well the firm can execute the strategy, and how the dynamics of the organization's foundation as well as the external environment evolve.

As discussed by Garth Saloner, Andrea Shepard, and Joel Podolny, competitive advantage is one of the most important elements in determining organizational performance.[2] Competitive advantage is what sets one organization ahead of another, enabling the first organization to grow or maintain market share. Competitive advantage takes two different forms, positional and capability.[3] Position-based competitive advantage is determined by an organization's position within its external environment and comes from things such as first-mover advantage, a strong brand, close relationships with customers, legislative protection, captive distribution channels, existing installed base, establishing standards, and power within a value chain. Capability-based competitive advantage is determined by the uniqueness of an organization and comes from things such as special competencies, processes, and other internal advantages that an organization can leverage but that its competition cannot.

Both position and capability-based competitive advantage enable an organization to deliver a product or service at a level of cost or quality or a combination of both which the competition cannot match. Competitive advantage is crucial to organizational success but hard to protect and maintain. The more attractive an organization's position within an industry, the harder its competition will work to reduce the strength of that organization's competitive advantage. The ever-changing nature of competition is one component of the fluid environment that is always challenging organizational position, threatening to topple dominant firms from leading positions.

As the Greek philosopher Heraclitus stated, "Nothing endures but change", commonly quoted as "The only constant is change."[4] Innovation is a powerful tool through which an

organization can build both positional and capability-based competition advantage. Innovation can also be used by organizations to combat change and the myriad array of internal and external challenges that it faces. Indeed, if an organization can consistently bring innovation to bear in how it develops, sells, and executes its products, services, and processes it stands a good chance of protecting its existing market position. If an organization can consistently innovate faster and more valuably than its competition, that organization will be well-positioned to increase both market share and market position. The ability to innovative successfully, repeatedly is one of the strongest sources of competitive advantage.

Given the benefits of innovation, it stands to reason that all organizations would do whatever they could to innovate on a regular basis. Yet innovation, particularly repeated innovation, is far from easy. Innovation requires that an organization be able to sense changes in the external environment and react appropriately, even if the most appropriate reaction requires a significant change in organizational strategy. Innovation requires that an organization not only be able to regularly generate new ideas for product, process, and service improvement but to create value through those ideas and then capture that value. These pre-conditions for innovation hint at the complicated foundation that organizations must construct if they are to become engines for innovation.

Thesis Overview

This thesis seeks to tackle the thorny challenge of organizational innovation and to propose a new strategy through which organizations may be able to build sustainable competitive advantage through successful, repeated innovation. Our research reveals that collective intelligence maps quite well as a solution to the primary causes of an organization's inability to innovate. Over the next several chapters, we will build a case for what we term to be *Collective Innovation*, the application of collective intelligence as a solution to the challenges of organizational innovation.

Specifically, our case will build as follows. In Chapter Two, we introduce the concepts of collective intelligence and openness as the foundation upon which *Collective Innovation* rests. In Chapter Three, we examine innovation and the challenges that it poses for organizations. In Chapters Four through Six, we propose the specific stages of *Collective Innovation*. Specifically, Chapter Four introduces the 'Idea Creation' stage, Chapter Five, the 'Idea Development' stage, and Chapter Six, the 'Idea Prioritization' and 'Idea Capitalization' stages. Having described the *Collective Innovation* process in depth, Chapter Seven then examines the organizational realities that will, in large part, determine the ultimate success or failure of *Collective Innovation*. In Chapter Eight, we describe the results of our primary research and four particular scenarios for the implementation of *Collective Innovation*. Finally, in Chapter Nine, we review the results of our research and examine its implications as well as some of the questions that remain to be answered.

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[1] Porter, M. E. How competitive forces shape strategy. *Harvard business review, 57*, 137-145.
[2] Saloner, G., Shepard, A., & Podolny, J. (2005). *Strategic Management*. New York: Wiley. P. 102.
[3] Ibid., p. 41.
[4] Laertius, D., & Hicks, R. (1979). *Lives of Eminent Philosophers*. Cambridge: Harvard University Press.

Chapter Two: Collective Intelligence and Openness

The Whole is Greater Than the Sum of its Parts

> *Knowledge is both explicit and tacit.* Some knowledge can be put on paper, formulated in sentences, or captured in drawings. An engineer, for example, conveys her knowledge of a product design through drawings and specifications, making what she knows explicit. Yet other kinds of knowledge are tied to the senses, skills in bodily movement, individual perception, physical experiences, rules of thumb, and intuition. Such tacit knowledge is often very difficult to describe to others...Recognizing the value of tacit knowledge and figuring out how to use it is the key challenge in a knowledge-creating company.[1]

The scenario presented in Chapter One is an example of how the tacit knowledge of individuals can be combined to create collectively superior solutions than any individual could create alone. As Surowiecki explains, "Tacit knowledge is knowledge that can't be easily summarized or conveyed to others, because it is specific to a particular place or job or experience, but it is nonetheless tremendously valuable...in fact, figuring out how to take advantage of individuals' tacit knowledge is a central challenge for any group or organization."[2]

Leveraging the tacit knowledge of a group of individuals leads to what is known as collective intelligence. George Pór, a researcher at the London School of Economics, has defined collective intelligence as "the capacity of a human community to evolve toward higher order complexity thought, problem-solving and integration through collaboration and innovation."[3] Insofar as it takes advantage of the tacit knowledge of many individuals, collective intelligence has tremendous potential to generate ideas and solve problems. The power of collective intelligence hinges upon both the number of viewpoints considered as well as the diversity of those viewpoints. In a closed system, where only similar viewpoints are considered, collective intelligence often fails to deliver much value beyond that which a single viewpoint could generate. Thus, collective intelligence cannot exist without openness. Openness is both

the ability and willingness to accept external ideas, be they external to oneself or to a team or to an entire organization.

The concepts of collective intelligence and openness are the two key drivers behind what we have termed *Collective Innovation*. This chapter will discuss both concepts in depth.

Collective Intelligence

Consider a discussion-oriented business school lecture. Eighty students sit in tiered rows, arranged in the shape of a horseshoe. The professor introduces the topic of the day and then poses a question to the class. Students raise their hands and the professor calls upon one of the students. The student offers an answer to the professor's question and the professor writes that answer on the chalkboard. The professor then turns back to the class and asks for alternative answers. Another student is called upon and another answer is written up the chalkboard. The process continues until the professor comments upon the answers, asks a new question and then seeks answers to this new question.

Since each student hears the contributions of their fellow students, answers are rarely repeated and often, as encouraged by the professor, students suggest answers that expand or build upon answers already provided. As the class continues, the chalkboard slowly fills with different answers. In some cases, the professor may have already thought of many of the answers provided, but often, the professor will hear unexpected answers, some valid, some not. In the end, the students in the class will generate a far larger number of ideas and a far greater diversity of ideas than any one student could have generated alone.

This classroom scenario is collective intelligence at work. As noted previously, collective intelligence is the leveraging of the tacit knowledge held by individuals to jointly generate ideas or solve problems. Collective intelligence is also known as 'crowd intelligence', a concept

recently popularized by *Wisdom of Crowds*, a book authored in 2005 by James Surowiecki. At its core, collective intelligence relies upon the gathering of viewpoints, the greater in number and the greater in diversity, the better. As Surowiecki writes, "Crowds that make the best collective judgments are crowds where there's a wide range of opinions and diverse sources of information, where people's biases can cancel themselves out, rather than reinforcing each other."[4] When properly constituted in this sense, crowds can deliver, on average, better performance than an expert.

To this point, in *Wisdom of Crowds*, Surowiecki examines the average performance of experts when compared to that of the crowd. He notes that, between 1984 and 1999, the vast majority of mutual-fund managers performed worse than the Wilshire 5000 Index and similarly, the vast majority of bond-fund managers perform worse than the market.[5] Despite the folklore's emphasis on the 'expert' or 'genius', individuals whose abilities, talents, and insights supposedly stand above all others, a significant body of research finds that experts, on average, perform lower than the masses. In the organizational world, executives are often elevated to the level of 'expert' and are expected to turn their own personal talents and experience into a unique brand of leadership. In reality, as Ancona, Malone, Orlikowski, and Senge write, executives must carefully recognize and then leverage the wisdom that surrounds them if they are to be successful.[6] As Surowiecki writes: "In part because individual judgment is not accurate enough or consistent enough, cognitive diversity is essential to good decision-making."[7]

Key Components to Proper Constitution

To perform well, collective intelligence rests on several principals.

Value of Numbers: Potential for Quantity to Deliver Quality

Collective intelligence is predicated upon the fact that the aggregation of greater than one viewpoint into a collective viewpoint will be more comprehensive and more valuable than a

single viewpoint. This strength of collective intelligence is closely tied into the age-old adage, 'quantity delivers quality'. Dean Keith Simonton sums it up succinctly:

> Study after study has found that those creators who are the most prolific by the inclusive definition are also the most prolific by the exclusive definition. In other words, productive quality of output, or socially certified creativity, is positively correlated with productive quantity, or mere behavioral output regardless of consequence. For example, U.S. Noble laureates publish two times as many scientific papers as do scientists still worthy enough to make it into American Men and Women of Science. The number of citations that a scientist received in the work of fellow scientists is strongly associated with the total output of publications; Moreover, this correspondence between quantity and quality holds over the long haul. For instance, the total length of the bibliography of a nineteenth-century scientist predicts how famous he or she is today.[8]

Drawing a connection between Darwinian evolution and creativity, Simonton continues:

> The more potential descendants generated, the more actual descendants may survive – and that is all that Darwin's theory demands; Fitness only permits the organism to make many trials, and many errors, with the implicit hope that at least one variant will carry its genes into the next generation; If the creative genius is generating failures as well as successes, this seems to support the assumption that the creative process is to a certain extent blind; The best the creative genius can do is to be as prolific as possible in generating products in the hope that at least some subset will survive the test of time.[9]

While the term 'collective', by definition, refers to a group and thus, more than one entity, it is commonly accepted that the power of collective intelligence increases with each additional individual involved in the collective.[10] This conjecture is supported by the 'first fundamental theorem of probability' which states "if an event of probability p is observed repeatedly during independent repetitions, the ratio of the observed frequency of that event to the total number of repetitions converges towards p as the number of repetitions becomes arbitrarily large."[11] Now, consider a crowd organized to guess the weight of a trash bin. In the context of collective intelligence, the first fundamental theorem of probability suggests that as the number of unique,

independent viewpoints generated as part of the collective increases, the probability of guessing the exactly weight of the trash can increases.[12]

Value of Diversity: Potential for Variance to Deliver Quality

Consider a group of five randomly selected individuals. A problem is posed to the group, the group is allowed to discuss the problem, and then the group generates a collective solution. Now, consider what might happen if one of the individuals within the group is cloned three times and each clone is added to the group. The group is now constituted of four different individuals and four copies of a single individual. More than likely, the viewpoint of the cloned individual would become dominant as the individual and her clones advocate the same viewpoint. In this case, by increasing the number of individuals within the group, the number of unique viewpoints within the group did not change. Indeed, the result of adding the clones may be simply that one viewpoint suddenly becomes dominant and overpowers the other viewpoints within the group. In this case, increasing the number of individuals within the group did not serve to improve the collective intelligence level of the group and, in fact, may have a negative consequence as unique viewpoints are lost due to the strength of a single viewpoint.

In addition to aggregating the viewpoints of at least two individuals, collective intelligence also requires that those two individuals possess different viewpoints. If a third individual is added to the collective, that third viewpoint will only serve to increase the level of the group's collective intelligence if it is a viewpoint that is different from the two existing viewpoints in the group. As the example noted above illustrates, increasing the numbers of individuals within a group does not alone guarantee that the collective intelligence of the group will increase. Indeed, the greater the diversity of the group, the higher the likelihood that the diverse perspectives of the group can aggregate together into a collectively intelligent solution. As Surowiecki notes, "The presence of a minority viewpoint, all by itself, makes a group's decisions more nuanced and its decision-making process more rigorous; even a single different opinion can make a

group wiser."[13] Surowiecki continues: "Groups are only smart when there is a balance between the information that everyone in the group shares and the information that each of the members of the group holds privately. It's the combination of all those pieces of independent information, some of them right, some of them wrong, that keeps the group wise."[14]

The concept of diversity, as a valuable group or team component, is hardly new. Many theories of human development cite the critical importance of mutation and variation or diversity to evolution. Diversity exists at the core of democracy, a political system that thrives upon the different perspectives of the citizenry. Successful organizations of all kinds thrive in part because they are able to aggregate the different viewpoints, talents, and strengths of their individual members towards a unified goal. Consider the famous quote by Linus Torvalds, the creator and now coordinator of Linux, as retold by Eric Raymond in his renowned paper on open source software, *The Cathedral and the Bazaar*: "'Given a large enough beta-tester and co-developer base, almost every problem will be characterized quickly and the fix obvious to someone.'" Raymond then goes on to distill the quote down to: "Given enough eyeballs, all bugs are shallow" and to refer to the quote as *Linus's Law*.[15] In essence, Torvalds and Raymond suggest that software bugs confounding one individual will be obvious and solvable to another individual. If you pass software code containing bugs in front of enough individuals who each view the code through different sets of experience, skills, ability, and tacit knowledge, all bugs can be identified and fixed.

To illustrate the importance of diversity to collective intelligence, Surowiecki references experiments performed by Scott Page. Through the use of 'problem-solving agents', Page performed experiments where two distinct groups of computer agents worked together to solve challenging problems. Page found that the group of agents comprised of both smart and less-intelligent agents frequently performed better than a group of only smart agents. The key

takeaway, as Surowiecki observed, was that "...on the group level, intelligence alone is not enough, because intelligence alone cannot guarantee you different perspectives on a problem."[16]

Surowiecki goes on to quote James March who theorized that "groups that are too much alike find it harder to keep learning, because each member is bringing less and less new information to the table. Homogeneous groups are great at doing what they do well, but they become progressively less able to investigate alternatives."[17] Surowiecki concludes by stating that "collective decisions are only wise...when they incorporate lots of different information...encouraging people to make incorrect guesses actually [makes] the group as a whole smarter."[18]

These observations on the power and importance of diversity are supported by a wide range of studies of organizational theory, creativity, and innovation strategy. In particular, diversity is one of the most powerful ways to combat narrow-mindedness and myopia in both teams and organizations. While offering strategies for promoting creativity within organizations, Albert Shapero recommends that organizations "...make up project groups to include people of different backgrounds" and to "over time, add new people to successful teams" such that viewpoints, which may have become increasing dominant, are questioned.[19]

Quantity of perspective is an important consideration when assessing the potential power of collective intelligence. Quantity of perspective alone does not reveal the power of a particular group's collective intelligence. Given that significant support placed behind a single perspective can have a notably detrimental impact on collective intelligence, diversity of perspectives within a particular group is as important a consideration as quantity.

Value of Informing: Potential for Communication to Deliver Quality

Although it is widely accepted that quantity and diversity are the key requires for collective intelligence to flourish, it has always been a challenge to bring large, diverse crowds together efficiently. Specifically, to take advantage of collective intelligence to solve problems, it is essential that each member of a crowd receive identical information regarding the definition of the problem as well as the overall perspective-gathering process. Historically, these requirements meant that crowds would have to gather together physically, greatly reducing the potential for both 'quantity' and quality'. Furthermore, it would conceivably take a significant amount of time and resources to both prepare for and execute a sizeable, diverse, physical gathering.

The rise in teleconferencing and other pre-Internet connection mechanisms reduced both the need for a physical gathering as well as the some of the associated time and resource costs. On the other hand, such connectivity introduced the challenges associated with the synchronous gathering of large numbers of individuals. While the requirement that each member of the crowd receive identical information is essential, it does not require that the gathering take place synchronously. Indeed, a live, synchronous, physical or remote crowd attempting to both consume and share information poses many challenges to efficiency and productivity.

In recent years, the evolution of technology, the Internet, and online applications provided a solution to these challenges. As Thomas Malone writes, "Today's new communication technologies make an efficient, decentralized system possible for the first time. Suddenly, it's cheap and easy for lots of people in an organization to get lots of information quickly and without distortion."[20] Arguably the most democratic, bidirectional information channel in history, the Internet is now accessible to billions of people around the world through

connected devices, a rapidly growth number of which offer high-bandwidth, low-latency connectivity at decreasing, flat-rate prices.

As the methods of connectivity to the Internet grow geographically and technologically, while decreasing in cost, the diversity of individuals connected to the Internet continues to grow. Through tools such as websites, wikis, blogs, forums, and email, information can be both disseminated and collected with both latency and cost approaching zero. In addition, consider the impact of the Internet as a solution to the problems of quantity and diversity - collective intelligence is now possible at a scale previously unthinkable through a rich depth and breadth of applications at minimal resource cost.

Collective Intelligence and the Organization

The knowledge that groups, when properly constituted and leveraged, make better decisions than individuals is as old as time itself. Throughout history, kings had advisors, the Greek and Roman empires had senates, and democracies have thrived. The power of leveraging multiple viewpoints to help solve problems and make decisions is significant.

The power of collective intelligence extends to the organizational level. Organizations are formed to accomplish a goal or a vision and multiple individuals contribute the necessary scale of resources and scope of perspectives and talents to accomplish that goal or vision. Collective intelligence is thus one of the central building blocks of organizations. At the most basic level, the very definition of 'organization' requires the involvement of at least two individuals. Aside from a clone of a single individual, the shift from a single individual to a pair of individuals notably increases the level of objectivity and diversity of experience present and the more individuals, the better. Such objectivity and diversity is critical to successful decision-making. As Surowiecki writes, "The more important the decision, the more important it is that it not be left in the hands of a single person...The best CEOs, of course, recognize the limits of

their own knowledge and of individual decision making...We know that the more power you give a single individual in the face of complexity and uncertainty, the more likely it is that bad decisions will get made."[21]

Consider the power of collective intelligence in the corporate world. As Surowiecki states, "Corporate strategy is all about collecting information from many different sources, evaluating the probabilities of potential outcomes, and making decisions in the face of an uncertain future."[22] For the most part, however, organizational strategy has always come from the top, from the executive suite. Even if the term itself is new, most people understand the principles and power of collective intelligence. Yet most organizations place power with the few, not the many.

Collective Intelligence and Organizational Problem-Solving

Surowiecki introduces three types of problems that crowds can solve quite well: cognition, coordination, and cooperation problems. Cognition problems are problems where there is one right answer, individuals generate the answers they believe are correct, and if the group is properly constituted, the aggregation of individual answers will be, on average, closer to that one right answer than the answer of any one individual.[23] The scenario described in Chapter One is an example of a cognition problem.

Coordination problems require an individual to consider the answer that she believes to be most correct, given the answer that other people believe to be most correct.[24] As an example of a coordination problem, Surowiecki describes William H. Whyte's research into pedestrian traffic on city streets.[25] To enable the whole crowd to make progress without crashing into each other, Whyte observed that each individual within the crowd must make minute, repeated, decisions and adjustments of course and speed. In effect, each individual takes the path they

believe to be most effective and efficient, given the paths that everyone else in the crowd are taking or will take, and the result is that all the members of the crowd get where they want to go.

Cooperation problems are similar to coordination problems, in that an individual must consider the answers generated by others. Cooperation problems differ from coordination problems, however, in that the correct answer is ultimately the one that delivers benefit to the group as a whole, rather than solely to the individual.[26] As examples of cooperation problems, Surowiecki references the concepts of "keeping the sidewalk free of snow, paying taxes, and curbing pollution", activities whose benefit is to society as a whole, more so than to an individual person.[27]

Consider the direct applicability of collective intelligence to organizational strategy. Organizations face cognition, coordination, and cooperation problems on a daily basis. When an organization has a problem to solve and is seeking ideas, the potential exists that there is one idea that represents the 'best answer' to that problem and a few or many ideas that represent 'good' or 'acceptable' solutions to that problem. This is a problem of cognition. Through collective intelligence, the variety of perspectives within a properly constituted crowd could be leveraged to generate good or acceptable solutions, if not that 'best' solution.

Once ideas are generated, the organization must develop those ideas and select the best possible ideas. In this case, idea selection is dependent upon the decisions made by the entities within the organizational context – competitors, suppliers, buyers, substitutes, and entrants. Essentially, the process for selecting the best idea for the organization to pursue must utilize 'game theory' as the organization assesses the possible reactions by those entities to each of its own possible actions. This is a coordination problem as the best idea will be the one

that enables the organization to create and capture the most value, given the potential reactions of all those other entities.

Once the top ideas are selected, the organization must then take the steps necessary to create value through the ideas and capture as much generated value as possible. When executing new ideas, particularly those most innovative or discontinuous, success for the organization often requires personal sacrifice – resources may need to be re-allocated from legacy projects and jobs lost, for example. Thus, much as with paying taxes, individuals within the organization may need to prioritize the best interests of the organization over their own. This is a cooperation problem.

While collective intelligence is one of the pillars on which all organizations are built, few organizations take tactical or strategic advantage of it. As it turns out, cognition, coordination, and cooperation problems are some of the biggest challenges organizations face and are challenges that collective intelligence is particularly well-suited to solve. Most organizations, however, assign individuals to solve such problems. Most organizations also fall short in another area critical to collective intelligence, the concept of 'openness'.

Openness

We define openness as the ability and willingness to take into account both internal and external perspectives. For an organization to practice openness, it must first recognize that the individuals of which it is constituted possess a wide range of tacit knowledge. The organization must also recognize that entities outside its boundaries, from companies in its immediate context to customers to individuals around the world, possess an even broader range of valuable tacit knowledge. Once an organization recognizes the existence of this tacit knowledge, it must take steps to harness its power, through strategies discussed later in this thesis. Openness is closely related to the concept of diversity discussed above, but it extends beyond

diversity in the recognition that individuals, even far beyond the walls of an organization and at any given moment, may hold the answer for which the organization is looking.

Consider Linux. Linux is an 'open source' operating system, developed by thousands of individuals around the world. While Linus Torvalds and others determine what code actually makes it into the Linux kernel itself, individual volunteers generate the vast majority of new code and check for bugs. Linux is presently used by for-profit and not-for-profit organizations around the world and has often been praised for its best-in-class stability and performance. In addition to Linux, thousands of open source software applications exist, from the Apache web server and Mozilla Firefox web browser to the Mediawiki server software and Blender 3D graphics package.[28] Although designed for different uses, each of these applications is the result of thousands of individuals around the world volunteering their free time and energy to software development.

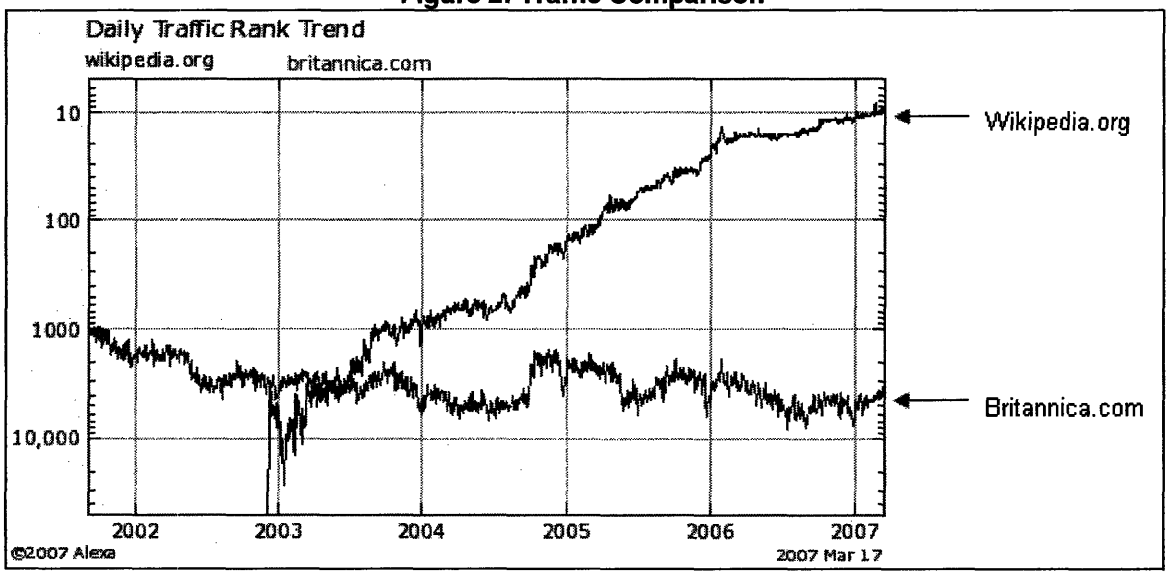
Also consider the Wikipedia, an online, collaborative, free, encyclopedia. There are now greater than 1.6 million articles on Wikipedia, written and edited by thousands of volunteers from around the world. Despite being 'open source' and freely-available, the accuracy of the Wikipedia is considered to be close to that of the Encyclopedia Britannica, according to an article written by Roy Rosenzweig in the June 2006 edition of the *Journal of American History*:

> In 2004 a German computing magazine had experts compare articles in twenty-two different fields in the three leading German-language digital encyclopedias. It rated *Wikipedia* first with a 3.6 on a 5-point scale, placing it above *Brockhaus Premium* (3.3) and *Encarta* (3.1). The following year the British scientific magazine *Nature* asked experts to assess 42 science entries in *Wikipedia* and [the online version of the] Encyclopedia Britannica, without telling them which articles came from which publication. The reviewers found only 8 serious errors, such as misinterpretations of major concepts—an equal number in each encyclopedia. But they also noted that *Wikipedia* had a slightly

> larger number (162 versus 123) of smaller mistakes, including "factual errors, omissions or misleading statements." *Nature* concluded that "*Britannica*'s advantage may not be great, at least when it comes to science articles," and that "considering how *Wikipedia* articles are written, that result might seem surprising."[29]

Although not perfect, the Wikipedia joins Linux as stunning examples of the power of the collective when information is contributed and organized freely. Indeed, Linux and Wikipedia are both excellent examples of the power of openness. Through a comparison of the online traffic reaching both sites, Figure 2 illustrates the popularity of the 'collectively-built' Wikipedia in contrast to Britannica.com.

Figure 2: Traffic Comparison



Openness and User Innovation

Eric von Hippel is frequently cited as one of the first individuals to identify and research the concept of user innovation. User innovation is a concept which identifies the end-users of product or service, rather than the creators or hosts, as the most likely generators of new, innovative ideas for that product or service. In 1986, von Hippel wrote *Lead Users: A Source of Novel Product Concepts*, an article in which he introduced the term 'lead user'. According to the article, lead users:

> ...are users whose present strong needs will become general in a market place months or years in the future. Since lead users are familiar with conditions which lie in the future for most others, they can serve as a need-forecasting laboratory for marketing research. Moreover, since lead users often attempt to fill the need they experience, they can provide new product concept and design data as well.[30]

As referenced by Thomas Peters, von Hippel researched 160 inventions and found that 70% of product ideas originated with users, 60% of minor modifications came from users, 75% of major modifications came from users, and 100% of first-of-type ideas were user generated.[31] Peters also describes von Hippel's findings that lead users do not have to possess PhDs, that they can be anyone, and that in order to take advantage of their viewpoints, organizations must stay in touch with such users and observe their frustrations and needs without impacting the natural flow of their use of the product or service.[32]

In recent times, the decreasing cost of communications and expansion of connectivity are allowing organizations to give users increasingly direct roles in product and service development. According to research by von Hippel and Katz:

> In [an] emerging new approach, manufacturers actually *abandon* their increasingly frustrating efforts to understand users' needs accurately and in detail. Instead, they outsource key *need-related* innovation tasks to the users themselves after equipping them with appropriate "toolkits for user innovation." Toolkits for user innovation are coordinated sets of "user-friendly" design tools that enable users to develop new product innovations for themselves. The toolkits are not general purpose. Rather, they are specific to the design challenges of a specific field or subfield, such as integrated circuit design or software product design. Within their fields of use, they give users real freedom to innovate, allowing them to develop producible custom products via iterative trial and error. That is, users can create a preliminary design, simulate or prototype it, evaluate its functioning in their own use environment, and then iteratively improve it until satisfied.[33]

The toolkits mentioned by von Hippel and Katz enable users to experiment with products and services, leading to the generation of new ideas, either evolutionary or revolutionary. Along these lines, online service firms such as Salesforce.com and Amazon.com are creating Application Programming Interfaces (APIs) and opening up their technology platforms to users and developers interested in building new applications as well as extensions of their existing applications.

The concepts of user innovation and the 'lead user' are dependent on an organization's willingness to embrace a philosophy of openness. Openness also requires that organizations consider the perspective of 'noncustomers', individuals who do not buy the organization's product or service, to understand just why those individuals do not consume. Finally, openness extends to the greater population at large. It is clear that the concepts of collective intelligence and openness go together nicely – collectivism requires numbers and diversity to succeed and a philosophy of openness is necessary to deliver the level of diversity necessary for collectivism to perform at a high level.

Collective Innovation

Collective intelligence has power. When constituted appropriately and applied carefully, collective intelligence can bring the knowledge, experience, and ideas of tens, hundreds, thousands, or millions of people to bear on a particular problem or set of problems. We believe, collective intelligence and openness have broad applications within the organizational world.

We believe collective intelligence, resting on a philosophy of openness, is particularly applicable to the problems organizations face when trying to innovate successfully and repeatedly. To this end, we believe that there exists significant potential for organizations to adopt a strategy of *Collective Innovation*. We define *Collective Innovation* as a connected, open,

collaborative process that generates, develops, prioritizes, and executes new ideas. *Collective Innovation*, in essence, is the application of collective intelligence to the innovation process.

Specifically, *Collective Innovation* begins with the recognition that members of an organization, from the youngest, most inexperienced individuals to the most senior executives, possess knowledge and perspectives that are oif value to the organization. *Collective Innovation* also requires the recognition that there are thousands, perhaps millions, of individuals outside of the organization whose knowledge and perspective can be of value to the organization. In essence, *Collective Innovation* requires organizations to "listen to their customers" and leverage the knowledge and perspective that everyone in their context, from lead-users to suppliers to other partners, can provide. *Collective Innovation* also requires that organizations recognize the distinct possibility that valuable, disruptive or discontinuous ideas may be generated by individuals far removed from the organization itself.

Indeed, as noted previously, the decreasing cost of communication, combined with growing connectivity, reduces the marginal cost of adding one additional individual to the collective to zero. Through one-to-many solutions such as email, websites, wikis, and blogs, it becomes possible to recruit individuals at the end of the 'long tail', individuals whose knowledge may be tangential at best or who may have a low probability of being uniquely valuable to solving the particular problem in question.

In his examination of 'skunkworks' organizations and the unpredictability of innovation, Thomas Peters cites the work of British economist, John Jewkes, who studied major inventions in the 20th century. According to Peters' citation, Jewkes "...concluded that at least 46 of the 20th century's 58 major inventions occurred in the 'wrong place'...Kodachrome film was invented by a couple of musicians, a watchmaker fooling around with brass castings came up with the

process involved in the continuous casting of steel...the developers of the jet engine were told by reciprocating-aircraft-engine people that it was useless."[34] James Utterback, in his book *Mastering the Dynamics of Innovation*, echoes Jewkes' findings, "...the initial use and vision for a new product is virtually never the one that is ultimately of the greatest importance commercially."[35] As these citations note, the most powerful disruptive or discontinuous innovations often come from this long tail, from sources and individuals tangentially connected to the industries in which the innovations ultimately find a home and have their greatest impact.

Once an organization recognizes the potential power of harnessing tacit knowledge and perspective, both internal and external, the *Collective Innovation* process then uses the power of technology and the Internet. Connected tools, ranging from websites and wikis to blogs and internal markets, can be used by the organization to harness knowledge and perspective, be they close at hand or around the world. Different applications of collective intelligence, through specific tools, apply at each stage within the innovation process, from the generation of ideas, to the development of those ideas, to the prioritization of the top ideas, and finally to the allocation of resources to those ideas to create and capture business value. Through this process, *Collective Innovation* harnesses the power of iteration and recursion and harnesses the power of large-scale collaboration, something that technology is just beginning to make possible.

Placing Collective Innovation in Context

The concept of *Collective Innovation* is a product of the present, a time where technology and connectivity enable the low-cost, yet widespread collection of human knowledge. In the history of innovation strategy, *Collective Innovation* would exist as the third stage, an evolution beyond *Open Innovation*, coming into vogue in the late 1990s and early 2000s, itself an evolution beyond *Closed Innovation*, in place still today with a history as long as the organization itself. The stages of innovation strategy are not distinct and organizations present or past, never pursued only 'closed' or only 'open' innovation strategies. Indeed, an *Open*

Innovation strategy fits nicely as a symbiotic partner to a *Closed Innovation* strategy. *Collective Innovation* is thus an evolutionary step beyond *Open Innovation*.

Closed Innovation ("Not Invented Here")

Until recently, it was quite difficult to capture, organize, and leverage the tacit knowledge held by individuals within an organization as well as individuals outside the organization. Indeed, for decades, the predominant organizational philosophy was 'Not Invented Here' (NIH).[36] NIH was a phrase that organizational employees would utter with disdain, a phrase suggesting that the quality of ideas, research, or knowledge generated outside of their organization could not be assured or even verified. NIH is an attitude that comes from solidarity, excessive pride, and confidence and can occur along organizational, cultural, political, economic, national, and religious lines. The NIH attitude can be a powerful unifying force and, in historical cases, is an attitude that reflected reality.

For the better part of the last century, corporations had few alternatives to funding internal research and development organizations. As described by Chesborough, few sources of research and knowledge existed outside of corporations throughout the 20th century - educational institutions were focused on research for science and theory development, rather than commercialization, and the government had yet to heavily fund such research.[37] At their core, organizations are formed to accomplish specific goals and corporations funding their own research and development resources to accomplish those goals during the 20th century had it correct – there were few alternatives, if any. In many situations during those days, an organizational NIH attitude, including suspicion of the quality or usefulness of ideas or concepts generated outside of the organization, most probably made sense. The 20th century was the '*Closed Innovation*' era. As Chesborough writes, it had a number of 'implicit rules':

> We should hire the best and brightest people, so that the smartest people in our industry work for us. In order to bring new products and services to the market, we must discover and develop them ourselves. If we discover it ourselves, we will get it to market first. The company that gets an innovation to market first will usually win. If we lead the industry in making investments in R&D, we will discover the best and the most ideas and will come to lead the market as well. We should control our intellectual property, so that our competitors don't profit from our ideas.[38]

Chesborough continues to explain that the *Closed Innovation* era featured a dominant model: investment in R&D led to breakthroughs in technology, which led to the creation of new products and features and resulted in increased sales and profits via existing business models.[39]

For the most part, a *Closed Innovation* strategy can be considered as an interdependent system. Christensen defines an interdependent system as one in which all components are proprietary and, much like the pieces of a puzzle, are designed to connect to other components of the system in a specific way.[40] Christensen also explains that interdependent systems can be considered 'optimized' or 'proprietary' and are designed to deliver a high-level of performance.[41] A modular system, on the other hand, is one where the interfaces between components are standardized or 'plug-and-play'. Again, according to Christensen, "...a modular [system] specifies the fit and function of all elements so completely that it doesn't matter who makes the components or subsystems, as long as they meet the specifications."[42]

Christensen's research reveals that new products and services are often initially developed as interdependent systems to ensure that they can achieve the level of performance that the marketplace requires. Extended interdependency, however, can deliver a level of performance beyond that which the marketplace is willing to pay for. At that point, the marketplace often looks for solutions which can deliver an acceptable level of performance while offering additional benefits, such as low cost or small size, both of which can be hallmarks

of modular systems. At this stage, modular systems often challenge the market position of interdependent systems and frequently win.

In addition to products and services, the concept of interdependent and modular systems can be applied to innovation strategy. Specifically, the *Closed Innovation* research and development era had all the hallmarks of an interdependent system - all elements of the process were kept internal and proprietary, designed to deliver the level of innovation and invention that organizations required. As mentioned earlier, the environment at the time was such that a closed, interdependent approach was not only the most appropriate approach, but in fact existed as the only approach possible.

As Chesborough writes, a number of trends came into effect during the later 20th century that caused some to begin to question the longevity of the *Closed Innovation* model. The rise in knowledge workers meant that when an employee would leave a company, his or her valuable knowledge and experience would leave as well and be increasingly difficult to replace. A growing number of individuals began to attend college as well as graduate school, creating a base of skilled individuals that were trained outside of corporate environments.[43] The venture capital industry began to flourish.[44] Products and services began to reach market more quickly. Customers and suppliers had greater access to information than ever before.[45] The concept of intellectual property, along with associated protections and laws, had a positive impact on the sharing of ideas. Educational institutions of all sizes, all over the world, began to conduct research with commercial application in mind. Government research subsidies grew.

All of these trends accelerated through the enablers of technology and the Internet. Over the last few decades, technology began to make it possible to collect, organize, store, search, and transport knowledge and information with decreasing cost and no degradation. The result

was a rise in decentralization.[46] The Internet allowed anyone with a connection to connect to anyone else, regardless of location. Individuals from around the world could engage in commerce together, connect socially, and collaborate, sharing knowledge and hobbies, solving problems, and working on projects.

Meanwhile, the continued efficacy of the closed, interdependent, innovation model is uncertain. According to the research of Raynor and Panetta on the pharmaceutical industry, the challenges the industry is facing "...have a common root cause: declining research and development (R&D) productivity, which has led to an unfortunate but unavoidable focus on [blockbuster drugs]. According to a recent U.S. Food and Drug Administration (FDA) report, since 1993 the industry's R&D expenditures have risen 250%, while the number of submissions to the FDA has dropped 71%. The cost per new approved drug has increased almost 800% since 1987, or 11% per year for almost two decades. In other words, the industry is spending more and more to deliver less and less."[47]

Still, the *Closed Innovation* model remains the dominant model for research and development in companies both large and small. The research referenced here, however, suggests that a new model, a more open, modular approach, may be better suited to the environment surrounding organizations in the 21st century. Organizations are recognizing the potential power of the knowledge that lies outside their research and development laboratories. Technology is making it possible to harness that knowledge with increasing efficiency and at rapidly decreasing costs. As discussed later, research also reveals that the *Closed Innovation* model frequently fails to identify disruptive innovation, removing many dominant firms from industry-leading positions. According to John Seely Brown, director of Xerox PARC from 1992 to 2002, "The corporate research labs of the old days are really not going to be the basis of what is new. This is getting to be a new kind of game."[48]

Open Innovation ("Profoundly Found Elsewhere")[49]

> Merck accounts for about 1 percent of the biomedical research in the world. To tap into the remaining 99 percent, we must actively reach out to universities, research institutions and companies worldwide to bring the best of technology and potential products into Merck.
>
> *–Merck 2000 Annual Report*

This 'new kind of game' may be what is called '*Open Innovation.*' An *Open Innovation* strategy strives to infuse an organization's innovation process with inventions and innovation external to the organization while at the same time, creating and capturing value externally from internal inventions and innovation that have greater value elsewhere. In 2005, Henry Chesbrough elaborated on the term:

> *Open Innovation* is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology...*Open Innovation* combines internal and external ideas into architectures and systems whose requirements are defined by a business model...The business model utilizes both external and internal ideas to create value, while defining internal mechanisms to claim some portion of that value.[50]

In addition, Chesbrough articulates some of the philosophical differences between *Closed Innovation* and *Open Innovation* in the following table:

Table 1: Contrasting Principles of Closed and Open Innovation[51]

Closed Innovation Principles	*Open Innovation* Principles
The smart people in our field work for us.	Not all the smart people work for us. We need to work with smart people inside *and* outside our company.
To profit from R&D, we must discover it, develop it, and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to market first will win.	Building a better business model is better than getting to market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our IP, so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

In 2000, when Procter and Gamble (P&G) CEO A.G. Lafley set a goal of sourcing half the firm's innovation from beyond its walls, it represented a significant shift from a largely *Closed Innovation* strategy to a more open innovation strategy. According to an article written by Larry Huston, Vice President for Innovation and Knowledge, and Nabil Sakkab, Senior Vice President for Corporate Research and Development at P&G:

> It was, and still is, a radical idea. As we studied outside sources of innovation, we estimated that for every P&G researcher there were 200 scientists or engineers elsewhere in the world who were just as good–a total of perhaps 1.5 million people whose talents we could potentially use. But tapping into the creative thinking of inventors and others on the outside would require massive operational changes. We needed to move the company's attitude from resistance to innovations "not invented here" to enthusiasm for those "proudly found elsewhere." And we needed to change how we defined, and perceived, our R&D organization–from 7,500 people inside to 7,500 plus 1.5 million outside, with a permeable boundary between them.[52]

A.G. Lafley's directive and the concept of *Open Innovation* in general are both supported by Suriowiecki who cites the particular weakness of alternatives, such as *Closed Innovation*, since "doing things in-house means, in some sense, cutting [companies] off from a host of diverse alternatives, any of which could help them do business better. It means limiting the amount of information they get, because it means limiting the number of information sources they have access to."[53]

Ralph Katz and Thomas Allen, in their research into the introduction of new technologies, also support the sensibilities behind *Open Innovation*, citing the importance of outside contact, of ideas from the external world, the value of interpersonal communication over formal technical reports, and the importance of being naturally willing or motivated to expose fresh ideas and new points of view as essential to organization research and development.[54]

Through his research, Alberto Shapero reveals the power of *Open Innovation* to positively influence organizational culture, citing the example of "...one company [who] set up a new products committee to which any employee, and not just professionals, could submit ideas. The committee, made up of senior scientists, product development people, and a patent lawyer, investigated and discussed each idea and wrote up a decision stating why the idea was accepted, rejected, or recommended for more research. By taking a positive and encouraging stance, the company developed a strong flow of ideas throughout the organization."[55]

In a new world of low-cost, near-ubiquitous connectivity, the legacy NIH attitude described previously seems quite anachronistic while a more modular, 'profoundly found elsewhere' attitude seems quite appropriate. However, despite improving protections, there remain concerns regarding intellectual property and such concerns must be considered carefully when involving individuals external to the organization in research and development processes. Yet, even when considering potential intellectual property concerns, we believe organizations pursuing *Open Innovation* stand a much greater chance of infusing their innovation processes with the level of diversity needed to deliver the most powerful results.

Collective Innovation ("Come Together")

> Most North American managers do not understand the importance of involving employees in early problem finding activities. They assume they are the only ones who know what needs to be done or that they can solve problems faster or better on their own. When these managers attempt to impose their solutions on their subordinates, there can be resentment and subordinates are often left uncommitted.[56]

Innovation strategies exist along a continuum from closed to open with organizations falling somewhere along the continuum. It is probably impossible to find an organization that pursues a purely closed or purely open innovation strategy. The vast majority of organizations continue to pursue strategies that lie towards the *Closed Innovation* end of the continuum.

Organizations such as P&G, 3M, and Eli Lilly, often cited as three of the most progressive organizations when it comes to innovation, continue to pursue strategies that are at best midway along the continuum.

Open Innovation suggests that organizations should take advantage of knowledge, both internal and external. *Collective Innovation* builds upon *Open Innovation*, by suggesting that organizations should take advantage of technology to weave sources of information together into unions more powerful than the individual sources themselves. *Collective Innovation* extends beyond *Open Innovation*, suggesting that organizations should harness the power of collective intelligence, not simply to generate ideas, but to develop those ideas further, to prioritize those ideas, and then to allocate resources to those ideas. As Rebecca Henderson suggested to us, "...*Open Innovation* could place the organization at the center of a cloud of sources of tacit knowledge, while *Collective Innovation* creates linkages between those sources. *Open Innovation* might be simply 'reaching out to sources of tacit knowledge', while *Collective Innovation* could be 'triggering a rich conversation among those sources'."[57]

While there may not be one right answer to a particular problem, there may be many good answers. A connected web of individuals, sharing tacit knowledge, increases the probability of generating good answers, if not the right answer. *Collective Innovation* harnesses the power of collective intelligence and the power of openness to improve the accuracy and efficiency of organizational innovation. In the next chapter, we will examine how a strategy of *Collective Innovation* could improve an organization's exploration processes while continuing to create and capture value from the products and services that generate revenue on a day-to-day basis.

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[2] Surowiecki, J., (2005). *The Wisdom of Crowds.* Garden City: Anchor. p.71
[3] http://www.community-intelligence.com/blogs/public/ (Accessed 9:23am, 3/14/07)
[4] Surowiecki, J., (2005). *The Wisdom of Crowds.* Garden City: Anchor. p. 227
[5] Ibid., p.33
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Chapter Three: Exploitation vs. Exploration

Companies that don't innovate, die.[1]

Throughout the 20th century, the concept of innovation became increasingly synonymous with organizational success. Over the past few decades in particular, it became commonly accepted that 'to innovate' was a good thing and that 'failing to innovate' was a bad thing. Innovation has many definitions. It is 'the creation of something new or different', it is the 'introduction of new things or methods', it is 'creating value out of new ideas, new products, new services or new ways of doing things', it is 'something new or improved'.[2]

Consider the following innovations: integrated steel mills, minicomputers, vacuum tubes, horse-drawn carriages, telegraphy, telephones, brick-and-mortar bookstores, traditional airlines, laser printers, and x-ray imaging.[3] Each of these innovations rose to positions of market dominance, either replacing the solutions used before them or creating a new market or industry, All of these innovations created significant value for their respective developers and manufacturers.

Now consider these innovations: steel minimills, personal computers, semiconductors, automobiles, telephones, mobile phones, online retailing, low-cost airlines, ink-jet printers, and ultrasound.[4] Each of these represented a radical innovation when they were first introduced. Over time, each of these solutions gathered momentum and either ended the reign of their respective predecessors, listed above, or captured significant market share away from those predecessors. Each of these solutions then created billions of dollars worth of value for their respective developers and manufacturers.

In these cases, and in many others, innovation simultaneously created and destroyed value for organizations. Incumbent organizations, enjoying a leadership position within their respective industries, suddenly identified a threat to their dominance. Upstart organizations, building on a disruptive innovation, began to attract customers away from those incumbent organizations. Rather quickly, the entrants rose from obscurity to directly challenge the position of those incumbent organizations. In many cases, by the time the incumbent organizations began to respond, it was too late. Research reveals that few incumbent organizations survive the arrival of an entrant-borne disruptive innovation.[5]

A significant body of research exists into this specific dynamic, the ability of innovation to simultaneously create and destroy significant value. In 1997, Christensen introduced the concept of 'the innovator's dilemma' in a book of the same name, subtitled 'When New Technologies Cause Great Firms to Fail.' Similarly, as referenced by Katz:

> Tushman and O'Reilly (1997) nicely [treat the failure of leading firms] in their research when they describe how Deming, probably the individual most responsible for jump-starting the quality revolution in today's products, highlighted this recurring theme in his lectures in which the most admired firms rapidly lost their coveted market positions. It is indeed ironic that so many of the most dramatically successful organizations become so prone to failure.[6]

Christensen and others have devoted significant effort to exploring the question of just why leading firms are so often toppled from positions of dominance by innovation. Clearly, incumbent firms never choose to fail or be disrupted and, in fact, just before their positions begin to weaken, it is safe to assume that those firms were doing everything they felt necessary to maintain their market-leading positions for the foreseeable future.

The Barriers to Innovation

"An Organization's Capabilities Define Its Disabilities"[7]

So why do leading firms so often fail when confronted with innovation? Organizations form to accomplish specific tasks and goals. Over time, organizations more or less optimize their processes specifically to those tasks and goals. In addition, organizational values develop around those processes. According to Christensen, values "are the standards by which employees make prioritization decisions – those by which they judge whether an order is attractive or unattractive, whether a particular customer is more important or less important than another, whether an idea for a new product is attractive or marginal..."[8] An organization's processes and values, if aligned appropriately, help place that organization on the road to success. Unfortunately, as Christensen writes, "...the very processes and values that constitute an organization's capabilities in one context, define its disability in another context."[9] According to Leonard-Barton:

> On the other hand, institutionalized capabilities may lead to 'incumbent inertia' (Liberman and Montgomery, 1988) in the face of environmental changes. Technological discontinuities can enhance or destroy existing competencies within an industry (Tushman and Anderson, 1986). Such shifts in the external environment resonate within the organization, so that even 'seemingly minor' innovations can undermine the usefulness of deeply embedded knowledge (Henderson and Clark, 1990). In fact, all innovation necessarily requires some degree of 'creative destruction' (Schumpeter, 1942).[10]

As Christensen intimates:

> ...a process that defines a *capability* in executing a certain task concurrently defines *disabilities* in executing other tasks...[processes] by their very nature are meant not to change. They are established to help employees perform recurrent tasks in a consistent way, time after time. One reason that focused organizations perform so well is that their processes are always aligned to tasks...values often represent *constraints* – they define what the organization *cannot* do.[11]

A large company may quickly dismiss an innovation because, according to its values, it cannot promise the scale of return necessary to have a measurable impact on its bottom line. A hardware company may quickly dismiss the idea of allocating significant resources to software development, even though software may be the key to its future. A successful organization becomes a closed system, targeting the needs of its business and the needs of its customers with a laser-like focus. While such a focus may drive short-term success, such a focus will frequently keep the organization from recognizing the path toward long-term success, particularly if that success requires a proactive or reactive encounter with radical innovation.

Organizational Structure

> Perhaps the deepest problem with the rigidly hierarchical, multilayered corporation was – and is – that it discouraged the free flow of information, in so small part because there were so many bosses, each on a potential stumbling block or future enemy. In their 1982 book *In Search of Excellence*, Thomas J. Peters and Robert H. Waterman reprinted a remarkable chart from an unnamed company that showed how many different paths through the bureaucracy a new product idea would have to traverse before it could be accepted. The number was 223.[12]

At a structural level, organizations naturally create barriers to innovation. The more successful an organization is, the stronger those barriers become. As Surowiecki finds, "...in too many corporations...the incentive system was (and is) skewed against dissent and independent analysis...[furthermore] there is a lack of diversity – cognitive and otherwise – among top managers."[13] Surowiecki also relays the findings of Chris Argyris, who found that "...one of the things that get in the way of the exchange of real information...is a deep-rooted hostility on the part of bosses to opposition from subordinates."[14]

In addition, as Katz and Allen point out, "...[organizational] problem-solving processes harden over time...those working on and committed to the old, invaded technology fail to

support radical new technology and instead, tend to fight back vigorously to defend and improve the old technology."[15] Furthermore, Katz and Allen find that "...increased behavioral and technical stability leads to isolation from outside sources of information and ideas lead to attached habits [which lead] to lack of vigilance in seeking information from the outside world [which] leads to complacency."[16]

Katz and also Allen find that successful organizations develop an 'ingroup bias' and seek out confirmatory perspectives, rather than contrasting or disagreeable perspectives, thus focusing on finding information that supports the dominant point of view.[17] The impact of a NIH attitude develops as well. Katz and Allen find that "...project members are more likely to see only the virtue and superiority of their own ideas and technical activities while dismissing the potential contributions and benefits of new technologies and competitive ideas and accomplishments as inferior and weak."[18]

Individual Level

In addition, organizational innovation is often derailed at an individual level. Consider an entry-level, customer-facing employee, an individual in sales or customer support, who spends most of her time working directly with customers of the organization's products or services. Through the depth of her contact with those customers, the employee develops a unique sense of the customer needs, both present and future. One day, the employee gains a clear sense of where customer needs might lie in several years and develops an idea for a new product. The new product, a significant departure from the organization's existing line of business, is extremely risky, but the employee takes the idea to her manager.

Her manager listens to the proposal. If the new product is radically different from the organization's existing products, such as a suggestion for a hardware company to develop a software product, the manager will frequently struggle with the 'capabilities define disabilities'

challenge noted above and most likely dismiss the idea, succumbing to myopia and narrow-mindedness. If the manager is able to see beyond such constraints, the she will most likely think to the future of the proposal – the product will require a significant up-front investment and the opportunity may not materialize at all. If the opportunity materializes, even though the payoff may be significant, that payoff will most likely not occur for several years.

The manager then considers her own career progression. If the manager supports the idea, the organization invests in the idea, and the opportunity fails to materialize, it could mean the end of the manager's career. If the manager supports the idea, the organization invests in the idea, and the opportunity materializes, but not for years, it will have no impact on the manager's current promotion cycle. Indeed, the manager may no longer be an employee of the organization by the time the payoff occurs. More often than not, given a rational risk and reward calculation, the manager will stop the idea from progressing.

Organizations fail to innovate for a myriad array of reasons. Some of them are structural. Some of them are borne out of the reasons for organizational success in the first place. Some of them are ingrained in human behavior. All of them are intertwined and extremely complicated. If the missteps that led to such failures were obvious and easy to avoid, all organizations would be able to identify those missteps and take the necessary corrective measures. As Katz offers, "...the pattern of success followed by failure – of innovation followed by inertia and complacency – is not deterministic."[19] It is important to recognize that the tactical and strategic choices which lead to failure may have a positive impact for the organization at the time while mortally wounding the organization in the future.

To this point, Christensen cites the concept of 'an innovator's dilemma', a paradox that exists when "...the logical, competent decisions of management that are critical to the success

of their companies are also the reasons why they lose their positions of leadership."[20] This duality of innovation, the fact that innovation lies at the core of both organizational success and failure, makes it imperative that organizations attempt to innovate successfully, repeatedly, while doing their best to recognize the signs of potentially disruptive innovation.

'The Ambidextrous Organization'

> The Roman God Janus had two sets of eyes – one pair focusing on what lay behind, the other on what lay ahead. General managers and corporate executives should be able to relate. They, too, must constantly look backward, attending to the products and processes of the past, while also gazing forward, preparing for the innovations that will define the future. This mental balancing act can be one of the toughest of all managerial challenges – it requires executives to explore new opportunities even as they work diligently to exploit existing capabilities – and it's no surprise that few companies do it well. Most successful enterprises are adept at refining their current offerings, but they falter when it comes to pioneering radically new products and services.[21]

Organizations must operate with two goals in mind. Primarily, organizations must deliver revenue-producing products and services to their customers and continue to improve those products and services over time to keep in line with customer needs and expectations. Secondarily, organizations must seek out new products and services to meet needs of which customers are not yet aware, to continue to grow, and to maintain and extend competitive advantage. Innovation is central to the accomplishment of both goals - to maintain product, process, and service evolution along sustaining or incremental dimensions as well as to generate product, process, and service discontinuities to gain radical advantage. Ultimately, organizations seek to balance operational excellence with creativity, to generate both the incremental and radical innovations critical to organizational success in the present and in the future.

In his research into the management of creative professionals, Shapero references prior research conducted by Steiner[22] who identified the following characteristics as central to the success of creative organizations: open channels of communication, encouragement of contact with outside sources, nonspecialists assigned to problems, ideas evaluated on their merits rather than on the status of their originator, management encourages experiments with new ideas rather than making 'rational' prejudgments, decentralization is practiced, autonomy is allowed creative professionals, management is tolerant of risk-taking, organization is not run tightly or rigidly and participative decision-making is encouraged. [23]

Steiner's findings are quite impressive, particularly since he was writing in 1965, deep in the heart of the *Closed Innovation* era. They speak to the concept of *Open Innovation.*[24] Steiner's findings also touch upon the type of culture, processes, and philosophies that can catalyze innovation and are important for what O'Reilly and Tushman term 'exploration'.[25] The challenge for organizations, however, stems from the fact that the culture, processes, and philosophies that enable exploration, are the opposite to those required to support the delivery of current products and services or what O'Reilly and Tushman term 'exploitation'.[26] According to Nemeth:

> Creativity and innovation may require a 'culture' that is very different and, in a sense, diametrically opposed to that which encourages cohesion, loyalty, and clear norms of appropriate attitudes and behavior...One must feel free to 'deviate' from expectations, to question shared ways of viewing things, in order to evidence creativity...One must learn not only to respect and tolerate dissent, but to 'welcome' it...The trick is to balance coordinated group activity with an openness to differing views – to create unity in the organization without uniformity.[27]

It is a fascinating conflict – the culture, processes, and values that make an organization successful today, can seal its fate and ensure its demise tomorrow. As echoed by Katz:

> Organizations must handle the challenge of operating efficiently in the present while innovating effectively for the future...[It is a] challenge of allocating resources for today vs. tomorrow...Organizations designed to do one thing right, will have a hard time doing another thing right...Organizations designed to do one thing once, will have a hard time doing it repeatedly...There is usually much disagreement within a company operating in a very pressured and competitive marketplace as to how to carry out this dualism.[28]

In essence, to achieve optimal success, an organization must 'exploit' and 'explore' at the same time with organizational exploitation efforts capturing value to enable its exploration efforts to create value to be captured in the future. O'Reilly and Tushman use the term, 'ambidextrous', to describe an organization that is able to prepare for tomorrow and identify innovative opportunities that may hold the key to the future, while executing at present and carrying out the tasks necessary to the sustain the organization on a day-to-day basis.[29] Katz and Allen summarize the key questions:

> ...how can one structure an organization to promote the introduction of new technologies and, in general, enhance its longer-term innovation process, yet, at the same time, satisfy the plethora of technical demands and accomplishments needed to support and improve the efficiency and competitiveness of today's producing organization?[30]

Organizations struggle to successfully answer this question. Katz continues to detail the challenges that P&G has faced in trying to be an ambidextrous organization:

> Witness for example the experiences of Procter and Gamble (P&G) over the past five or more years. In the beginning, the analysts claimed that P&G was doing a very good job at managing its existing business but unfortunately was not growing the company fast enough through the commercialization of new product categories. Over the last couple of years, P&G impressively introduced a number of very successful new products (Swiffer, Whitestrips, Thermacare, and Febreze – just to name a few) that are collectively bringing in considerably more than a billion dollars in added revenue per year. The analysts, however, now claim that while P&G has managed to introduce some very exciting new products, in doing so, it took its eye off the existing brand sand

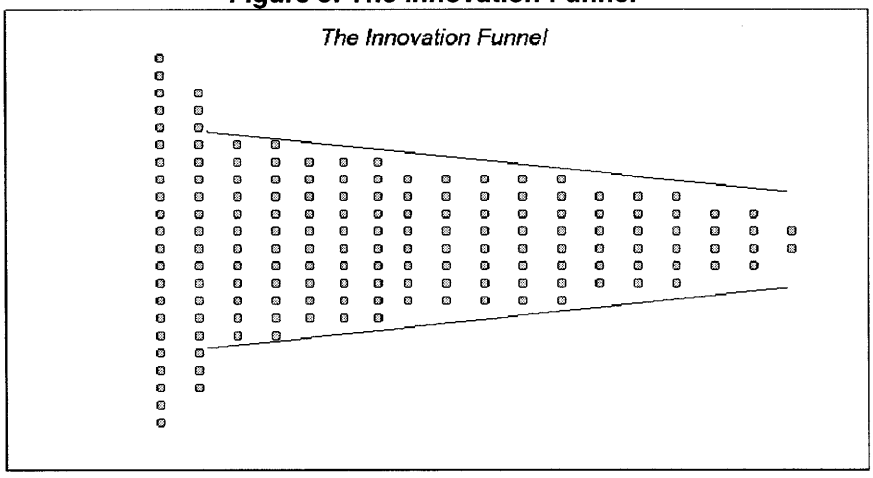
> lost important market share to very aggressive competitors. It is not particularly surprising that these same analysts now want P&G to de-emphasize its new venture strategies and investments in order to concentrate on protecting and strengthen its bedrock major brands. The pendulum just seems to keep on swinging.[31]

Exploration Powered by Collective Innovation

While there is not a 'one-size-fits-all' strategy to becoming an 'ambidextrous organization', a strategy of collective innovation is a potential solution. Specifically, consider the reasons presented as to why organizations so often fail to innovate. In many cases, the viewpoint of a single individual causes innovation to fail. In other cases, the viewpoints of several individuals within an organization reinforce each other and lead to decisions which cause innovation to fail. Collective innovation, in harnessing quantity, diversity, and connectedness, can avoid these challenges. *Collective Innovation* applies the collective wisdom of individuals internal and external to organizations to all stages of the innovation process.

The *Collective Innovation* process, like many models of innovation, uses the metaphor of a funnel to depict how a large, diverse collection of idea nuggets at the beginning of the process is reduced to just a few, mature, executable ideas at the end of the process (See Figure 3). Specifically, the *Collective Innovation* process describes the entire evolution of an idea, from a mere creative spark that occurs in an individual's head, to the development and prioritization of that idea, to the organization's capitalization of the idea by turning it into an official initiative complete with dedicated resources, labor, and funding.

Figure 3: The Innovation Funnel



The *Collective Innovation* process features four stages, each of which has a distinct goal as well as a distinct set of challenges to overcome to reach that goal. Each of the next four chapters (See Figure 4) examines a particular stage, outlining its goal, how to address the challenges, and an assessment of the benefits and drawbacks of an approach using collective intelligence. In practice, the stages operate in serial fashion, as an assembly line, but ideas can exit any of the first three stages and re-enter the process at an earlier stage, a concept that will be discussed later.

Figure 4: Stages of Collective Innovation

Stage 1: Idea Creation	***Stage 2: Idea Development***	***Stage 3: Idea Prioritization***	***Stage 4: Idea Capitalization***
Objective: Generate the most number of ideas possible	*Objective*: Refine potential solutions to make a viability assessment	*Objective*: Generate a rank ordered list of each viable solution	*Objective*: Appropriately allocate capital, labor and resources to vetted solutions

The next three chapters then present the stages of the innovation process. First, a problem is identified, necessitating a solution. Stage One of the innovation process is the 'idea creation' stage, during which potential solutions are generated in the form of thoughts. Stage Two of the innovation process is the 'idea development stage', during which those thoughts are collaboratively expanded, refined, and developed into executable ideas. Stage Three of the

innovation process is the 'idea prioritization stage', during which those ideas are ranked and top ideas selected. Stage Four is the 'resource allocation stage', during which those top ideas are allocated resources and slotted into a schedule such that they might create value for the organization to capture. In following chapters, we will explore the respective stages, the barriers to innovation at each stage, and how the use of collective intelligence can address those barriers. The entire process, progressing through each stage, is what we term *Collective Innovation*.

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[17] Ibid.
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Chapter Four: Stage One: Idea Creation

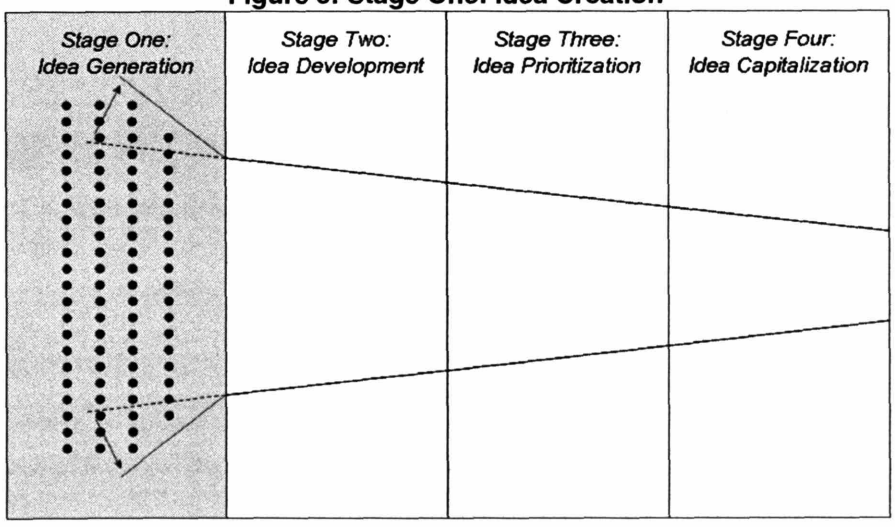
Solving a Problem

Collective Innovation begins with a problem that an organization needs to solve. It is the generation of innovative ideas to solve this problem that is the objective of the *Collective Innovation* process (See Figure 5).

The Importance of Problem Definition

Organizations of all types face myriad problems necessitating innovation to identify an optimal solution. The variety of these problems can be placed on a spectrum in terms of the degree of specificity. At one end of the spectrum lie high-level problems that primarily concern senior management. The other end of the spectrum follows the organizational hierarchy down to the customer-facing employee or laboratory scientist. Regardless of the problem and the level of the organization that wrestles with it, having a clear understanding of the challenge at hand is of the utmost importance - contributors to potential solutions must have a sense of what constitutes success.[1]

Figure 5: Stage One: Idea Creation



The Spectrum of Specificity

Consider the problems that exist at the highest level of an organization. As detailed by Christensen in *The Innovator's Solution*, a major challenge is the need for public companies to

grow faster than Wall Street expects.[2] Christensen notes how Wall Street analysts discount the expected value of a public company's future growth to calculate the valuation of the company in present dollars. This valuation is then factored into the existing stock price via market forces trading the security. Thus, to increase stock value, a public company must grow faster than expected and as Christensen describes, other than from acquisitions, organic growth via sustaining and disruptive innovation can provide the source of such growth.[3]

In the middle of the problem spectrum, middle management generally faces the challenge of determining what exactly these innovations are. Often the innovations take the form of product line extensions or other new strategies to differentiate products in the market with respect to competition. At the other end of the spectrum of specificity, a scientist may need to increase the temperature tolerance of a material by two degrees. Another example may be a marketing challenge, such as how to achieve a specific level of brand awareness within a target audience. Regardless of its location along the spectrum of specificity, each particular problem must be defined as clearly and concisely as possible to provide alignment with specific business objectives.

Problem Interdependency and Modularity

It is essential that organizations take the time to analyze their particular problem to determine if it is an interdependent problem or a modular problem. A modular problem is a problem that can be broken down into several smaller problems that, when solved, solve the original problem. For example, consider the scenarios described above. An organization faces the need to grow more quickly that Wall Street expects – that is a high-level, modular problem. By further differentiating a particular product in the marketplace, the organization knows that it will grow. By improving the temperature tolerance of the core material within the product, the organization knows that it will result in product differentiation, thus resulting in the growth that the organization needs. This is an example of how a complex problem (how to grow more

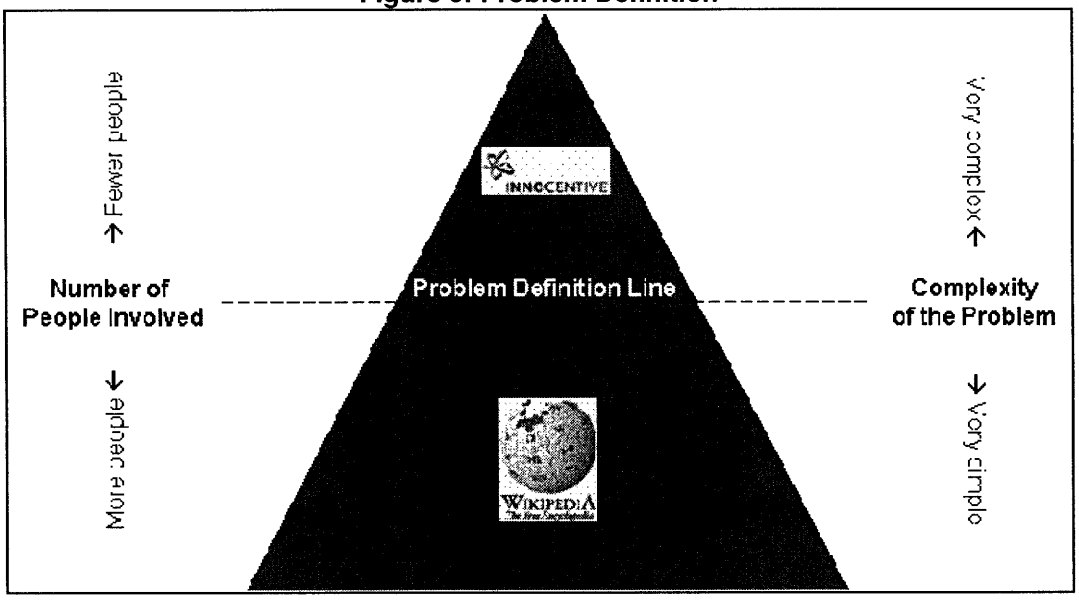
quickly) can be modularized into component parts that may be more easily solved than simply tackling the complex problem as a whole.

Many seemingly complex problems can be broken down into individual sub-problems that are more easily solved. Consider Wikipedia.org. Wikipedia was designed to be a freely available, open-source encyclopedia. Simply contemplating the creation of such a resource is a dauntingly complex problem but through an open-source approach, Wikipedia's founder was able to modularize this complex problem into innumerable smaller problems, the creation of articles. Given that knowledge is omnipresent, virtually anyone could tackle those problems by contributing to articles. In addition, as numerous individuals work on any particular article, the articles, in essence, are modular problems themselves. By completing individual sections of articles, individuals help solve the problem of creating the overall article. By completing articles, individuals help solve the problem of creating the overall encyclopedia.

There are, however, interdependent problems that cannot be modularized. Consider the game of chess. In order to win at chess, an individual must have a strategy to pursue during the course of the match. That strategy is dependent upon a sequence of moves that must be made in concert. If the individual were to take a modular approach to chess and simply make the 'best possible move' at any given moment, it may result in temporary advantage, but will most likely result in the loss of the match. Indeed, the individual must make moves in sequence to set up future moves if the strategy is to be successful.

Our research has revealed, however, that interdependent problems are relatively rare and that most organizational problems can be modularized. See Figure 6 for a visual description of the relationship between problem complexity, problem definition, and number of individuals who might be able to help solve the problem.

Figure 6: Problem Definition



Problem Definition in Practice

To illustrate problem definition, consider the strategy of InnoCentive, a firm whose approach is described in detail in Chapter Eight. InnoCentive provides a consulting service to clients facing scientific challenges which they have not been able to solve through their own internal research processes. InnoCentive consultants work with these clients to articulate and break down their problem sufficiently as to be able to measure an appropriate solution as well as to increase the number of potential people in the network who may attempt to solve the problem. A monetary bounty is posted online, along with the problem and anyone able to generate an appropriate solution receives the bounty. According to InnoCentive's Chariman, Alph Bingham, a $1 million problem modularized into ten $100,000 problems stands a much higher change of being solved than if a single $1 million problem were to be offered.[4]

To ensure clients understand this reality, InnoCentive actively coaches their clients in how to break down very complex problems into palatable portions. The focus and clarity of the challenge at hand encourages a greater number of solutions and quality of thought. Figure 6 attempts to visually describe the importance of problem definition. As the complexity of any

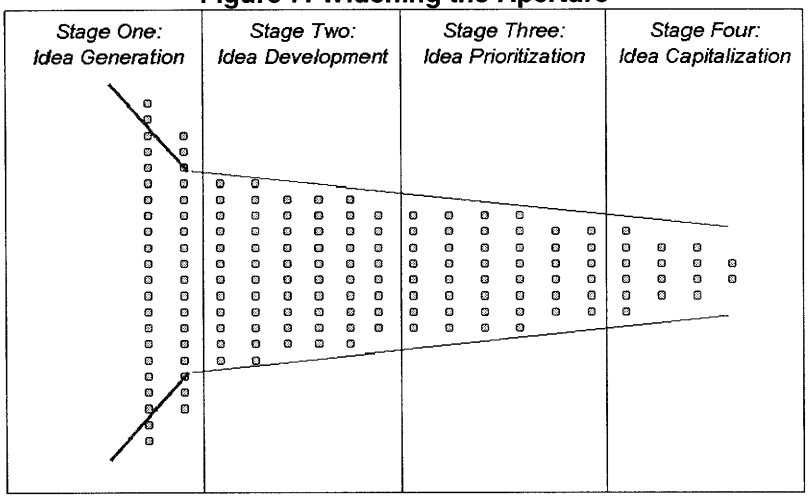
single problem increases, the number of people who can individually come up with a solution decreases. That is, as the line defining a problem's complexity moves up and down, the pool of problem solvers decreases and increases, respectively. Therefore, the objective in defining a large problem, and what InnoCentive has learned in practice, is to appropriately break down a problem to increase the number of solutions.

The Funnel Aperture

Once a problem is clearly defined, the relationship between quantity and quality (as described in Chapter Two) dictates that the probability of finding a good solution to the problem will increase in concert with the number of ideas generated. Thus, the objective of Stage One is to generate the largest number of ideas possible and in the context of the innovation funnel, to make the aperture of the funnel as wide as possible (See Figure 7). In *Open Innovation*, Chesborough advocates reaching outside an organization to generate ideas from customers, suppliers, partners, and all other stakeholders in the market or value network. We agree with this approach and a "philosophy of openness" is a central tenet to the *Collective Innovation* approach.

In Stage One, however, *Collective Innovation* extends beyond *Open Innovation* in two areas: First, we advocate reaching beyond an organization's value network to involve what are essentially random individuals, not connected to the organization, in the innovation process. Secondly, *Collective Innovation* advocates for an iterative process of idea creation, achieved through the connection of individuals through carefully structured brainstorming.

Figure 7: Widening the Aperture



The Piña Colada Guy

> "...ideas come from everywhere. Some people think that ideas come from the top down. Some think they come from the bottom up. They come from everywhere...If you make the capturing of ideas simple and low cost, a lot of people will share ideas."[5]

Collective Innovation and *Open Innovation* are initially similar as both advocate reaching outside an organization to involve a greater number of individuals in the innovation process. *Collective Innovation* takes the concept of openness further, however, extending it to include just about any individual in the process. Given the tenets of collective intelligence, we propose that organizations can achieve greater innovation performance by including individuals disconnected from the organization and indeed, somewhat randomly chosen. We affectionately refer to such an individual as the Piña Colada Guy, someone serving cocktails on the beach of a tropical resort. Much as Scott Page's experiments, as detailed in Chapter Two, revealed that a combination of intelligent and less-intelligent agents outperform a group of solely intelligent agents, we propose that the inclusion of the Piña Colada Guy, an individual without any direct knowledge of the organization, can contribute to the innovation process in a number of ways.

Value in Uniqueness

When we discussed the value of diversity to the innovation process, we emphasized the importance of tacit knowledge, the idea that the intangible value accumulated through a

person's unique experience and their mental models inherently possess incremental value when contributed to the collective.[6] In other words, with the exception of clones, every person added to the collective contributes unique knowledge, incrementally increasing the power of the collective.

In addition to the unique knowledge contributed by the hypothetical Piña Colada Guy, such an individual also injects a certain amount of randomness into the mix, another means of achieving diversity and sparking creativity, as discussed in Chapter Two. A creative spark may come about because of his diverse background, particularly as it relates to the existing collective. Alternatively, he may initiate an interaction with another member of the collective which could trigger a unique insight which becomes a novel solution to the problem at hand.

Intersection of Ideas

To this point, the inclusion of the Piña Colada Guy can also help drive what von Hippel terms *Lead User Innovation*. In his book *Democratizing Innovation*, von Hippel uses mountain biking to describe how lead users draw upon their membership in different communities to "come up with a different innovation."[7] For example, a mountain biker who is also an orthopedic surgeon may draw upon his knowledge of the human body to create a suspension system that reduces the shock to a person's spine. Von Hippel then contrasts this example with that of a mountain biker who is also an aeronautical engineer who might come up with a different innovation by drawing on his different background in engineering.[8]

Von Hippel's observations center on the value created when two sources of information come together within a single individual (e.g. the orthopedic surgeon who enjoys mountain biking). An alternative approach, which achieves similar, novel innovation, occurs when two individuals come together, each with a unique idea, and they combine their ideas to generate a unique breakthrough. Academia, with its emphasis on discourse, the exchange of information,

and sharing of experiences, is an excellent environment within which such 'idea intersections' can occur and often generate breakthroughs and unique insights in multiple fields.

The Santa Fe Institute, an organization born by bringing together people from many different disciplines for an exchange of ideas, is another environment within which the exchange of experiences yields innovation.[9] The organization regularly brings together individuals from diverse backgrounds, including biologists, physicists, and economists. After providing a basic overview of their own field, since most individuals do not have a working knowledge of other disciplines, they present research problems they are facing and source the group for solutions to those ideas. Frequently, the members of the Institute generate ideas to apply to problems in fields that at first glance, do not seem to have anything in common. For example, Eric Bonabeau derived a solution to computer networking problems from a discussion about insect behavior, specifically ants. In his book, *Swam Intelligence*, Bonabeau and his colleagues describe in detail how members of the Santa Fe Institute suggested that the manner in which ants search and discover sources of food might provide the basis for network routing algorithms to improve the performance of data transmission.[10]

Brainstorming

After an organization clearly defines the problem it needs to solve and casts its net for ideas as widely as possible, Stage One of *Collective Innovation* dictates that the organization should poll its own employees as well as individuals external to the organization for solutions to the particular problem. Organizations must create a careful brainstorming strategy, one that avoids the pitfalls of brainstorming while leveraging its benefits.

Specifically, researchers investigating the efficacy of the different methods of brainstorming have observed that bringing a group of individuals together into a room to generate ideas is inferior to allowing participants to initially contemplate their ideas separately.[11]

The common misconception of brainstorming is that a group of individuals creates an environment in which each individual builds upon ideas generated by the group in an iterative process that yields additional ideas at each iteration. The reality is that certain group dynamics often emerge, such as the confusion of status with knowledge, the playing out of political biases depending upon who is in the room, the pressure of sycophancy when aptitudes of verbal communication vary significantly within the group, production blocking, evaluation apprehension, and free-riding which all reduce the group's effectiveness.[12]

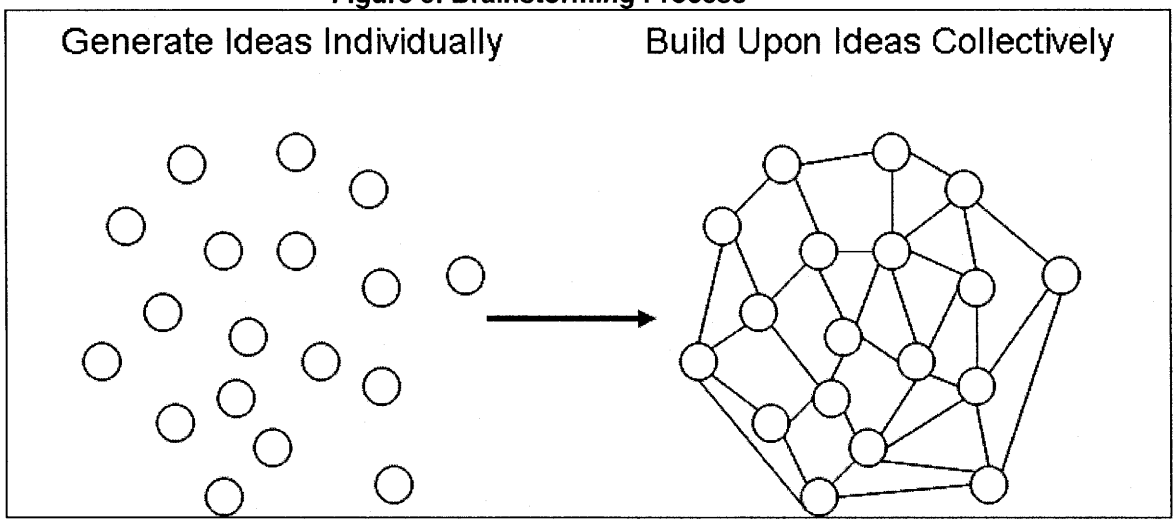
Until recently, therefore, the optimal method of generating the largest number of ideas featured individuals separately tackling the challenge of evaluating a problem and generating solutions – according to research, this approach clearly yields a larger quantity of ideas and appears to be superior in terms of quality as well.[13,14] Technology has now evolved to a point at which organizations can leverage online and electronic solutions to engage in this careful brainstorming in a manner that is both inexpensive and efficient at generating large quantities of ideas.

Electronic Brainstorming

The Stage One process continues as one might expect. If utilizing email, participants submit ideas to a moderator who aggregates the submissions and then returns the list to the group members for further idea generation and feedback. Alternatively, contributors can draft ideas in one "window" while simultaneously viewing the ideas generated by others in a second "window". In either approach, ideas are first generated, then shared, and the process repeats iteratively to generate even more ideas (See Figure 8). Standardization is also critical – ideas must be submitted via a standard form such as those used by Cambrian House, a firm described later, and also Google's "Sparrow Pages".[15]

A variety of research supports the effectiveness of these methods. According to Gallupe et al, "...advocates suggest that this method allows a person to build on and be inspired by others' ideas without the blocking that occurs in face-to-face interaction. Groups that use electronic brainstorming produce more ideas per person than face-to-face groups and do not appear to suffer from individual productivity loss when compared with nominal groups."[16] Additionally, electronic brainstorming allows for the electronic archival and, in effect, retrieval and discussion at a later time. Finally, the electronic method allows the participation rate to scale, in theory, infinitely that is otherwise not possible for the alternative methods.

Figure 8: Brainstorming Process



Again, it is the connectedness that drives the value in the process. In Stage One, performance is assessed by the number of ideas generated and the iterative nature of the electronic process. Stage One leverages the power of individual effort, complemented by aggregation through anonymous electronic means to yield a volume and quality of submissions that was previously impossible. This approach is quite similar to the manner in which people are already working online, through blogs, wikis, forums and discussion boards and the unique ways in which people are connected in these various communities.

Finally, for this Stage to perform well, all ideas must be welcomed. Discrimination of ideas at this stage not only discourages creativity, but fails to establish cultural norms among participants that this behavior is not only accepted but encouraged. Indeed, from a cultural perspective "...it is the process of getting involved in one's work that counts, not the quality of any single idea."[17]

Vignette: Open versus Collective Innovation

We would like to address more explicitly some of the subtle differences and nuances between *Open Innovation* and *Collective Innovation*. Therefore, we close this chapter with a vignette that compares the two approaches.

If Chesborough's definition of *Open Innovation* includes the Piña Colada Guy, then our point of differentiation advocates that he is a critical part of the collective particularly when it comes to the creative process and generating a novel approach. In terms of the funnel analogy, if we consider *Open Innovation* as a process that includes the Piña Colada Guy, then the aperture of open and aperture of collective are the same and the examples of the Big Idea Group, Cambrian House, and InnoCentive fit the criteria for both *Open Innovation* and *Collective Innovation*.

However, if we consider *Open Innovation* as only recommending that organizations reach out to lead-users and partners and suppliers and buyers (e.g. their own context), then *Collective Innovation* adds a new dimension with the addition of Piña Colada Guy and expands the aperture of the funnel. In addition to everyone in the organization's immediate context (buyers, suppliers, partners), we now have a pool of participants that is several orders of magnitude larger than those only in the context of a specific organization.

Consider the example of SolutionPeople's Thinkathon.[18] Thinkathon is a communal brainstorming activity that SolutionPeople, a consulting firm, undertakes for clients. Groups of individuals, ranging from just a few to several thousand, are gathered into a room. Client-selected problems or topics are presented to the gathering and the individuals present silently note their ideas on personal worksheets. Those worksheets are then distributed to others in the group, allowing new individuals to build upon the ideas of other individuals. At the end, the ideas are reviewed by the client and SolutionPeople employees and promising ideas are shared with the entire group. According to SolutionPeople, a gathering of 8,000 people generated 454,000 ideas in 60 minutes at Singapore Stadium and a gathering of 500 people at a conference generated over 5,000 ideas in 10 minutes.[19]

With individuals first noting their own ideas, before sharing those ideas and building upon the ideas of others, Thinkathon is a wonderfully iterative example of how a large-scale, physical *Collective Innovation* brainstorming session would work. The challenge in this context is that few opportunities present themselves in which thousands of people can congregate for the purpose of idea generation. Moreover, there is no situation outside of the electronic in which many thousands or millions of individuals can brainstorm together.

From Creation to Development

During Stage One, a large number of thoughts are generated to solve an organizational problem. The key point is how people are connected. Electronic tools and web-based media allow for managers to create environments and processes that overcome the challenges of evaluation apprehension, free riding, and production blocking in the brainstorming process. Iteration is a key element in this process to generate an even greater number of thoughts.

Once a mass of thoughts are generated, they need to be parsed, examined, organized, and developed into executable ideas – the job of Stage Two, Idea Development.

[1] Previous research advocates that the complexity of a problem limits the number of people who can legitimately contribute to solutions. We do not wholly disagree, but as previously discussed, we argue that the unique tacit knowledge an individual inherently possesses can inspire novel ideas through the diversity that the individual brings to the group. Additionally, breaking down a problem increases the number of people who can contribute to the solution because the complexity is reduced to sub-components such that disciplines are now in a position to contribute. Here, our focus is on problem definition for addressing the problem at hand.

[2] Christensen, C., & R., M. (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth.* Boston: Harvard Business School Press. Chapter One.

[3] Ibid.

[4] Authors' interview with InnoCentive Chairman, Alph Bingham, on April 3, 2007

[5] Marissa Mayer, Google's Vice President for Search Product and User Experience, http://blog.fastcompany.com/archives/2004/03/14/google_innovation_and_the_web.html (Accessed 10:22am, 4/22/07)

[6] Sterman, J., (2000). *Business Dynamics.* Boston: McGraw-Hill/Irwin

[7] Hippel, E., (2006). *Democratizing Innovation.* Cambridge: The MIT Press.

[8] Ibid., p. 35.

[9] Waldrop, M., (1992). *Complexity.* New York: Simon & Schuster

[10] Bonabeau, E., Dorigo, M., & Theraulaz, G. (1999). *Swarm Intelligence.* Oxford Oxfordshire: Oxford University Press.

[11] Davis, J. H. (1992). Some compelling intuitions about group consensus decisions, theoretical and empirical research, and interpersonal aggregation phenomena: Selected examples, 1950-1990. *Organizational Behavior & Human Decision Processes, 52,* 3-38.

[12] Diehl, M., & Stroebe, W. (1991). Productivity loss in idea-generating groups: Tracking down the blocking effect. *Journal of Personality & Social Psychology, 61,* 392-403.

[13] While the individuals could then gather into a group to discuss their ideas after initially generating individual sets of solutions, it is generally considered essential that the group generate ideas individually before any communal activity.

[14] James H. Davis, *Organizational Behavior and Human Decision Processes (1992),* Some Compelling Intuitions about Group Consensus Decisions, Theoretical and Empirical Research, and Interpersonal Aggregation Phenomena: Selected Examples, 1950-1990. Evaluating the quality of ideas is challenging but the consensus is that in-person group brainstorming is inferior to the nominal group approach.

[15] Ibid.

[16] Gallupe, R. B., Dennis, A. R., Cooper, W. H., Valacich, J. S., Bastianutti, L. M., & Nunamaker, J.,Jay F. (1992). Electronic brainstorming and group size. *Academy of Management Journal, 35,* 350-369.

[17] Katz, R., Editor, (1997). *The Human Side of Managing Technological Innovation.* Oxford Oxfordshire: Oxford University Press. *Managing Creativty: A Japanese Model* (Min Basadur) p. 67.

[18] http://www.solutionpeople.com/thinkathon.htm (Accessed 11:02am, 4/23/07)

[19] Ibid.

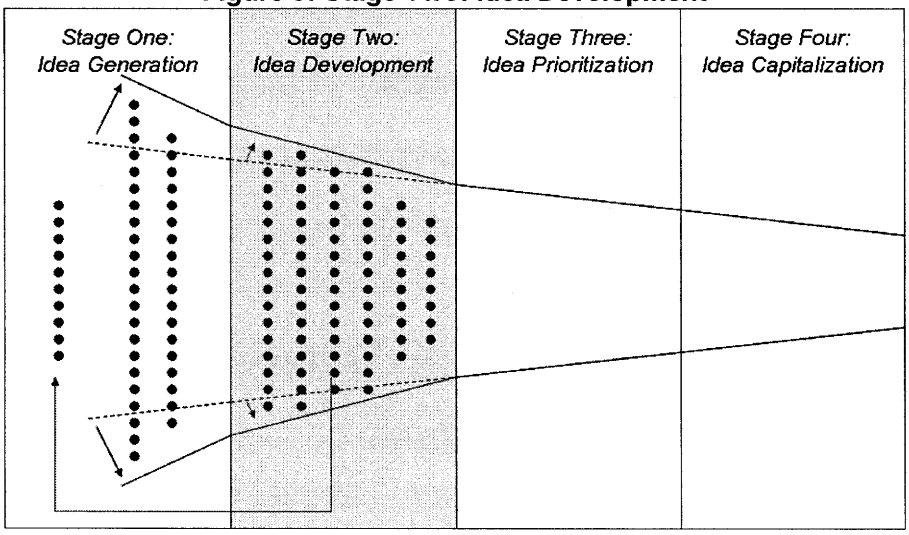
Chapter Five: Stage Two: Idea Development

Moving into the Innovation Funnel

Let us assume that Stage One has generated 10,000 ideas which represent the pool of potential solutions to the problem the organization is attempting to solve. What is a manager to do with such a vast number of ideas? Sifting through this pool and making sense of it is a daunting challenge. Stage Two of the *Collective Innovation* process is concerned with just that task – the use of collective intelligence to refine the original mass of contributions into developed, promising ideas (See Figure 9). This Chapter delves into the practical applications of idea development: How exactly does an organization manage 10,000 ideas? What is the role of management? What management tools are available for such a task?

The Power of Collective Collaboration

Figure 9: Stage Two: Idea Development



Recall Linus's law from Chapter Two: "Given enough eyeballs, all bugs are shallow." One of Linus Torvalds' messages regarding software development, which is analogous to distributed user innovation, is that decentralization can dramatically reduce cost while increasing the speed with which product development occurs. This holds true because as the collective increases in size, the tacit knowledge increases bringing to bear new and potentially novel

approaches to developing solutions. Moreover, as users share knowledge the collective can create non-linear improvements to existing solutions. In Linus's words, as a greater number of beta-testers are added, it increases the probability that someone's toolkit will be matched to the problem in such a way that the bug is shallow to that person. It is essential, however, to also keep in mind the power of connectedness. Beyond simply passing bugs in front of large numbers of eyeballs, Linux is a project that pulls a worldwide community together, connecting software developers, enabling them to share information and build upon each other's work. It is the power of this phenomenon that drives Stage Two.

MathWorks, a software development company in Natick, MA, is an excellent example of how an organization can harness a group of individuals to generate solutions and then, through competition and cooperation, evolve those thoughts iteratively into an optimal solution or solutions. The MathWorks MATLAB contest achieves impressive results in a short period of time, results that would be impossible for an individual to achieve in a similar timeframe.

MathWorks

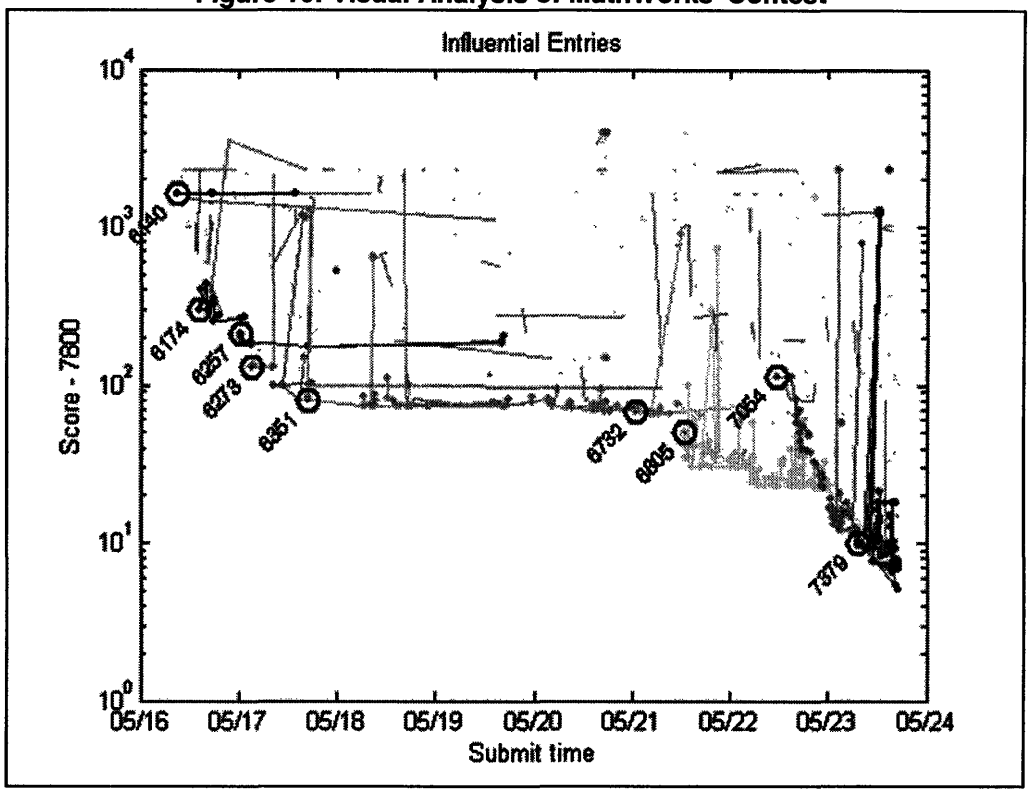
MathWorks developed MATLAB, a scientific computing application. Every six months, the Company holds the following programming contest: A problem is posted on the MathWorks website and contestants submit MATLAB programs designed to solve the problem. MathWorks has a server that automatically tests each entry, as submitted, for correctness and efficiency. Each entry is automatically posted to the website as well and other contestants may build upon previous entries and resubmit a new entry. Over the course of the contest, the first-place entry steadily improves as contestants build on each other's work and try to outdo each other.[1]

The results of these contests are truly amazing and MathWorks publishes detailed analyses online. Consider Figure 10, a graph that displays the evolution of "parent" ideas and the "offspring" of the parents. Looking at the graph, the ideal solution exists at the bottom right.

The measure is, in essence, efficacy and efficiency – one can think of the metrics in terms of speed and processing power required.

There are two separate phenomena displayed in Figure 10. Families of programs can be denoted by the numbered circles presented on the chart – 6140 and 6174 are part of the first family, 6257, 6273, and 6351 are part of the second family, 6732 is part of the third family, 6805, is part of the fourth family, 7054 is part of the fifth family, and finally, 7379 is part of the sixth family. First, if we single out each family of programs, we can see dramatic improvements over time. Clearly, this occurs as coders share their programs and improve upon them. There are obvious incremental improvements as well as discontinuities. Second, this trend of improvement is further highlighted when we observe all submissions in aggregate (e.g. the frontier created by all submitted programs). The initial submissions (the first and second families) make substantial jumps in efficiency over the course of the first couple days then they seem to plateau. This continues for about three days and can be seen leading to 6732. Then, somewhat spontaneously in the last three days, the submissions start making another set of improvements stemming from the third family (notice the vertically downward movement). And in the last day the even more dramatic improvements can be seen in the sixth family.

Figure 10: Visual Analysis of MathWorks' Contest[2]



Given the competitive nature of the contest, direct interaction among contest participants does not often occur. The design of the competition, in which participants submit their work over time and can see and use other submissions, however, in essence creates interaction. Furthermore, all of the contestants share information when they submit their programs because everyone can see their work. It is this approach which serves as a proxy for making the connection between individuals and encourages direct discourse and collaboration. The particular value of the MathWorks contest is that it harnesses the power of the collective, through both competition and collaboration, by thoughtfully considering how to connect people.

Iteration

Of particular note, the MathWorks contest leverages iteration, an important component to Stage Two. Research into creativity suggests that a quiet period is helpful, if not critical, to creative development.[3] This suggests that there is value in the "process" by which this naturally

occurs and allows for two things to happen: The originators are allowed to step away and contributors work on the idea during the originators' downtime. The combination of originators' idle time and of contributors filling in results in rapid iteration of idea development.

Specifically, MathWorks' design of the MATLAB Contest capitalizes on creative downtime by allowing submission and derivatives to be developed. This process of iteration, as the *Collective Innovation* framework suggests, increases not only the speed of development but also the quality of the work - it is important that organizations consider how such iteration and creative downtime might be leveraged internally.

The Cacophony of 10,000 Ideas

Hearing the Message through the Cacophony

The MathWorks case provides a strong existence proof of the power of the collective to collaboratively develop raw ideas into final solutions. Stage Two of the *Collective Innovation* process suggests how organizations might make use of the tacit knowledge of their employees to identify promising thoughts from the mass of ideas generated from Stage One and then develop those thoughts into ideas that the organization might execute. Here we draw upon the success of Web 2.0 and the wide range of online tools that millions of individuals presently use in their personal lives. Specifically, in Stage Two, the mass of thoughts generated from Stage One are placed in a database and employees use Web 2.0 tools to organize, develop, and evolve the most promising ideas. There are both bottom-up and top-down approaches to Stage Two and organizations should use both approaches as appropriate to make this Stage successful.

Bottom-Up Idea Development

The purpose of bottom-up idea development tools is to tap the self-organizing behavior and distributed time and knowledge of employees. Consider the various examples of these community tools that make up Web 2.0: wikis, blogs, favorites lists, tags, tag clouds, "digg-style"

ranks and feeds, Really Simple Syndication (RSS) feeds, permanent-links, and suggestion engines. Organizations can use each of these tools to both parse a database of thoughts and to begin to develop those thoughts into executable ideas. Consider the following tools and their Stage Two applications:

Digg.com-style Rankings

Digg.com is a website where popular online content is ranked by the masses. Members of Digg.com find articles, videos, or podcasts online and submit it to Digg.com, either via the Digg website or a variety of applications.[4] Once entered, the submissions are immediately viewable on the Digg.com submission page where other Digg.com members can either 'digg' the content, if they like it, or 'bury' the content if they dislike it. Once a submission receives a certain level of 'diggs', it becomes a popular submission and becomes viewable on a Digg.com page dedicated to the category in which the submission fits (See Figure 11). If a submission does not receive that level of 'diggs', it is removed from the Digg.com submission page. While there is also a community component to Digg.com, where members discuss submissions, the power of Digg.com is in the use of the collective to promote or demote submissions.

Figure 11: Digg.com Screenshot

Consider the use of the Digg.com model to parse through the mass of thoughts generated by Stage One. If the correct incentives are in place, a challenge discussed later, employees could review the database and 'digg' thoughts they find promising and 'bury' thoughts they do not find promising. This process could simply leverage 'thumbs up' or 'thumbs down' buttons attached to each thought in the database or it could extend to a '1 – 10' ranking to offer a greater level of granularity. Over time, the thoughts receiving the most 'diggs' would rise to the top of a separate ranking page, while thoughts receiving 'burys' might either remain in the database or be removed from the database. If the database is structured to enable the efficient review of the mass of thoughts by participants, a Digg.com-style review and rank approach could enable an organization to parse the output of Stage One fairly effectively.

Tags and Tag Clouds

Tagging is a Web 2.0 technique that attaches keywords or phrases to online elements such as websites and multimedia content. For example, a picture of vacation scene might receive such tags as 'beach', 'sun', 'vacation', 'water', 'towel, and 'bathing suit'. Once a website or piece of content is tagged with such keywords or phrases, a search containing one of the keywords or phrases can reveal a link to the particular website or piece of content. As is the case, tagging is a popular way to organize content and make it searchable. A tag cloud is a visual display of the most popular tags used for a certain database of websites or content. For example, if a certain number of elements within the database receive a specific tag, that tag might appear in the cloud. As the number of elements featuring that tag increases, the tag itself increases in size and boldness to represent the popularity of the tag. Tag clouds are a method by which tagged content can be ranked (See Figure 12).

Figure 12: Sample Tag Cloud

Consider the use of tagging and tag clouds to organize the raw thoughts in a database. Participants reviewing the thoughts can tag thoughts with keywords and phrases that come to mind. This strategy would enable the organization of thoughts into categories built from keywords and phrases. As certain keywords and phrases are repeated in the database, they may become part of an online tag cloud that anyone can view. The potential exists, for example, for management to recognize an emerging trend as certain tags become increasingly popular due to a growing number of thoughts in a particular area filling the database from Stage One. Participants could also tag thoughts with keywords matching specific organizational groups or divisions and the database could automatically push those thoughts to members of that group or division for review.

Suggestion Engines

Suggestion engines are used by a wide range of online sites, including Amazon.com and Buy.com. Specifically, suggestion engines are used to identify and suggest content to a user that is similar to the content that the user is currently viewing or searching for. In the Amazon.com and Buy.com examples, suggestion engines identify the specific product that a user is considering buying and suggest other similar or related products that the user might be interested in buying. Consider an organization using a suggestion engine in concert with

Digg.com-style ranking and tagging. As a participant ranks specific thoughts highly, a suggestion engine could identify similar thoughts in the database, based upon tags, and provide links to those thoughts to the participant.

Consider as well a simple yet powerful example of two novels published a decade apart, and the power of suggestion engines. The first book, *Touching the Void* by Joe Simpson, recounted an extraordinary adventure in the Andes, but enjoyed limited popularity.[5] Approximately ten years later, Jon Krakauer wrote *Into Thin Air* about his travails climbing Mt. Everest, a book which met with tremendous publishing success.[6] Shortly after *Into Thin Air* was published, sales of *Touching the Void* sales picked up and the publisher released a new edition. Bookstores set up promotional displays with both books side by side and before long, *Touching the Void* began outselling *Into Thin Air*.[7] The culprit was Amazon.com's suggestion engine.

The success of *Touching the Void* hinged entirely upon a change in context among the public, coupled with the power of a suggestion engine connecting two books separated by a decade. Managers should be acutely aware of the power of this type of situation and put in place mechanisms (e.g. tags and recommendation engines), to connect people and ideas.

Wikis

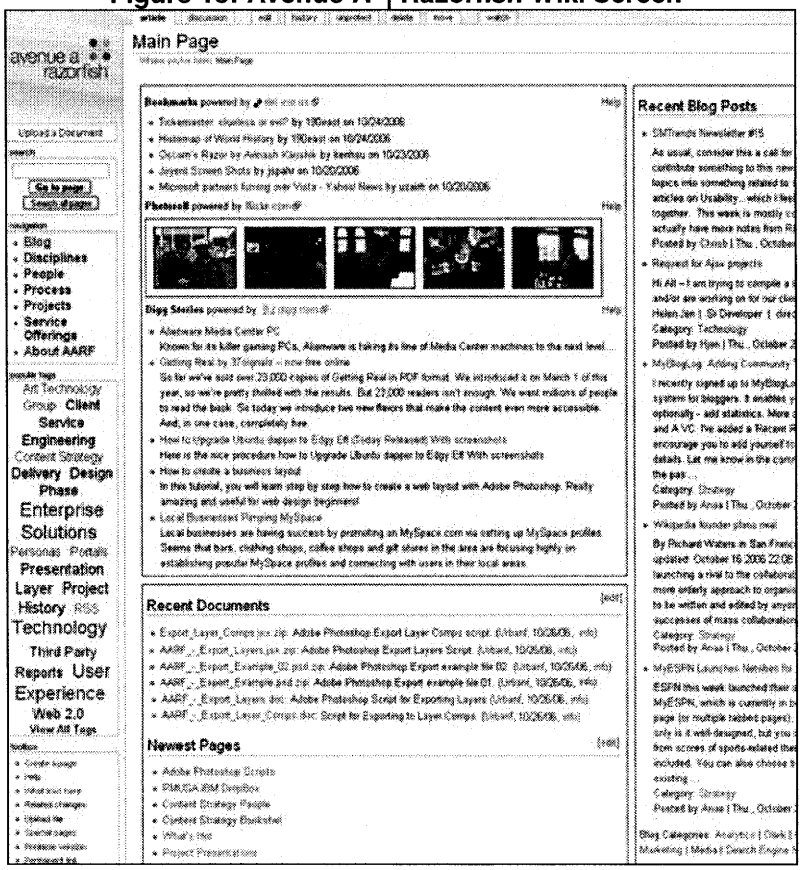
A wiki is an online, collaborative tool that allows anyone to create and edit content in a communal workspace. Flexible, adaptable, and easy-to-use, the wiki has become one of the most popular online tools during the past few years, powering a vast number of sites including Wikipedia.org.

Wikis have particular value in Stage Two of the *Collective Innovation* process. As a thought receives significant attention, through ranking and tagging, for example, the thought could have a wiki attached. The wiki would then form the centerpoint for all development of the

thought as anyone could contribute and edit comments, post multimedia content and links, and work together to further shape and form the thought into an executable idea.

Avenue A | Razorfish is a consulting and advertising agency that recently began to explore how a wiki could be used to improve company operations and sense of community. The wiki draws upon popular Web 2.0 tools such as del.icio.us, Digg, Flickr, and blogging to bring together sites, news articles, documents, and viewpoints of employees throughout the company (See Figure 13). As an employee stumbles upon a website or article they feel might be of interest or value to others within the Company, the employee bookmarks the site using del.icio.us, "digg" the article using Digg.com, or tag a photograph through Flickr and each of those sites pushes the particular link, citation, or photograph to the Company wiki. Employee email to the various email lists within the Company is also published to the blog, along with documents that employees upload. While the site is in its infancy, we found employees of Avenue A | Razorfish quite excited about its potential during our interviews.[8]

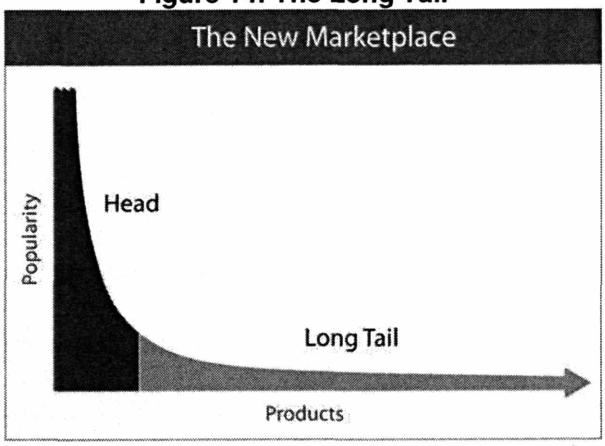
Figure 13: Avenue A | Razorfish Wiki Screen[9]



Long-Tail

There is an irresistible connection between disruptive innovation and the 'long-tail', a concept introduced by Chris Anderson in 2004.[10] The 'long tail' describes a statistical phenomenon in which high probability events eventually give way to low probability events (See Figure 14). Through his research, Anderson describes how Amazon.com's business model allows it to make available not only the most popular books at any given time, but also to offer an unprecedented range of obscure books for sale.[11] Since Amazon.com can find obscure books through partners and does not have to keep them in inventory, it can generate sales for books existing towards the end of the long tail whereas other brick and mortar retailers cannot.

Figure 14: The Long Tail[12]



In the world of innovation, many radical or disruptive ideas exist toward the end of the long tail as outliers, ideas initially discarded or considered too strange to be valuable. Given that *Collective Innovation* is designed to gather thoughts from a scale and scope of sources previously thought unattainable, the potential is quite high that many such thoughts might arrive in an organization's database. Through the use of the aforementioned Web 2.0 tools during Stage Two, an organization can increase the chance that a potentially disruptive idea will catch the eye of someone who can appreciate it. Furthermore, if there is a mechanism that automatically sifts thoughts long tail thoughts and ensures that those thoughts are viewed regularly, the possibility exists that a thought generated 'before its time' might be recognized for its value when the time is right.

The Value of Bottom-up Idea Development

Much as they are popular in the personal lives of employees, the Web 2.0 tools noted here have potential for use at Stage Two. Although the initial mass of thoughts exiting Stage One can be quite daunting, employees equipped with the tools they use in their personal lives can separate promising candidates from the mass. Furthermore, employees can use these tools to collaboratively develop and extend thoughts to a point at which they represent ideas that the organization might consider executing. Managers of the system could also generate lists of the most visited wikis or those ideas to which a great number of people have contributed. Sometimes equally useful are those sites that are at the bottom of a rank order – perhaps they

are promising, but market, industry, or technological conditions are not yet right for their execution. Furthermore, if implemented carefully, the use of Web 2.0 tools to engage employees in idea development has power to positively enhance organization culture and employee commitment.

Top-Down Idea Development

In addition to a bottom-up idea development strategy, an organization can also leverage a top-down idea development strategy. Providing order similar to a bottom-up approach, top-down tools also create context, a common language, and clear problem definition to employees participating in Stage Two.

An excellent example of a top-down strategy within an organization is for management to introduce a taxonomy for all thoughts submitted. Each thought falls into a specific classification. For example, Rite-Solutions is a company that implements a taxonomy in a successful top-down Stage Two approach (See Appendix D for additional information). Specifically, the Rite-Solutions taxonomy provides context to employees as each category holds potential innovative thoughts with different time horizons, risk levels, and potential value to the company. For example, thoughts placed in the 'Spazdaq' generally will have a longer time horizon since they are new or potentially radical and discontinuous ideas, while 'Savings Bonds' thoughts, designed to help the company operate more efficiently, will generally expose the company to little risk.

These underlying assumptions actively translate into a language shared by employees and thus facilitating communication among them. Clear benefit also comes in the form of focus and problem definition. Employees inherently understand the perspective of upper management that the 'Bow Jones' index represents the core business and is the opportunity to exploit their current offerings. Similarly employees understand that 'Savings Bonds' initiatives are

exploitation opportunities while thoughts in the 'Spazdaq' comprise the exploration part of the business' future growth.

From Development to Prioritization

During Stage Two, a large number of thoughts are parsed, examined, organized, and developed into executable ideas. Stage Three relies heavily on iteration – the concept that participants will work together to steadily sift through the mass of thoughts, to identify promising ones, and then to collaboratively develop those thoughts into executable ideas which the organization might consider supporting. The evolution of technology and the Internet has also resulted in the creation of a number of different Web 2.0 tools which can be used to accomplish these tasks. Finally, organizations have both bottom-up and top-down approaches at their disposal and must choose the mix that is most appropriate.

The ideas exiting from Stage Two must now be prioritized and then allocated resources – the job of Stage Three, Idea Development, and Stage Four, Idea Capitalization. These Stages are the subject of the following chapter.

[1] http://www.mathworks.com/contest/overview.html (Accessed 12:25pm, 4/22/07)
[2] http://www.mathworks.com/contest/furniture/evolution.html (Accessed 12:29pm, 4/22/07)
[3] Johansson, F., (2006). *Medici Effect*. Boston: Harvard Business School Press; Katz, R., Editor, (1997). *The Human Side of Managing Technological Innovation*. Oxford Oxfordshire: Oxford University Press. *Managing Creative Professionals* (Albert Shapero)
[4] http://digg.com/how (Accessed 1:48pm, 4/22/07)
[5] Simpson, J., (1988). *Touching the Void*. New York: HarperPerennial.
[6] Krakauer, J., (1998). *Into Thin Air*. New York: Anchor Books/Doubleday.
[7] http://www.wired.com/wired/archive/12.10/tail.html (Accessed 5:18pm, 4/22/07)
[8] For an in-depth examination of the Avenue A | Razorfish intranet, visit: http://blog.hbs.edu/faculty/amcafee/index.php/faculty_amcafee_v3/now_thats_what_im_talking_about/
[9] http://blog.hbs.edu/faculty/amcafee/index.php/faculty_amcafee_v3/now_thats_what_im_talking_about/ (Accessed 11:31am, 4/23/07)
[10] http://www.wired.com/wired/archive/12.10/tail.html (Accessed 11:34am, 4/23/07)
[11] Anderson, C., (2006). *The Long Tail*. New York: Hyperion.
[12] http://www.beatb.org/podomia/img/longtail.png (Accessed 9:32am, 4/24/07)

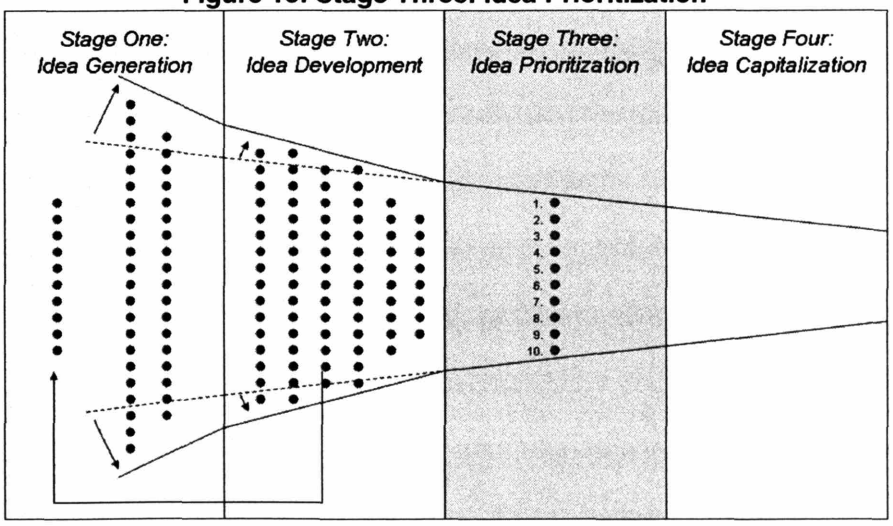
Chapter Six: Stage Three and Stage Four: Idea Prioritization and Idea Capitalization

Stage Three: Idea Prioritization

Collective Selection

Thus far we have covered Stage One and Stage Two of the *Collective Innovation* process. The combined objective of Stage One and Stage Two is to generate the greatest number of thoughts possible and then to use employees to objectively analyze, rank, and develop those thoughts into executable ideas. The objective of Stage Three (See Figure 15) is to prioritize the ideas emerging from Stage Two – to generate a rank ordered list of projects towards which a company should invest its time, money, and resources. Of course, the challenge during this period is how to make sense of the potentially significant volume of ideas exiting Stage Two.

Figure 15: Stage Three: Idea Prioritization



Indeed, the ideas flowing into Stage Three may number in the thousands, given the sheer volume now entering the funnel. Even after the development that occurred in Stage Two, these ideas may exist in a variety of states, running the gamut from the raw to those initiatives that have been refined almost to the point of commercial application. The good news is that managers have numerous methods and tools that can be used to create a prioritized list from

this vast pool, but what are these tools and when are they appropriate? Moreover, how does a manager go about ranking the ideas without getting lost in the vast amount of information?

The Innovation Hurdles

To answer these questions, it is important to consider why an organization should rely upon the collective to yield a list of the ideas that should be top priorities for the organization as a whole. Why should senior management turn to its employees – and beyond – to determine the strategic direction of the company? Strategic planning is a complex process with many factors and variables to consider. It is precisely when the complexity of a problem reaches a certain threshold that the collective thrives and generates insightful opinions because if the aggregation method is correct, all tacit and private information is accounted for. While achievable by the collective, management alone could not possibly comprehend and process the information and make the appropriate trade-offs to create a rank ordered list of initiatives.

Dirk Jenter also presents evidence revealing how executives can distort judgment and skew analysis in the course of making business decisions. Jenter's research findings demonstrate that executives are hampered by psychological factors making them "especially prone to display overconfidence" in their abilities. What is more, "overconfident CEOs tend to overestimate the quality of their investment projects," creating unnecessary risk taking behavior. The risk taking takes the form of over-investment from internal funds versus utilizing capital sources external to the company (e.g. debt markets) and "over-acquiring" of other companies (e.g. overconfidence in deal synergies, falling victim to the winner's curse).[1]

Not only do organizations face systemic challenges in the innovation process which are tied to cultural and political issues, but companies also face dynamic and complex competitive environments. There are also psychological factors involved (e.g. overconfident managers). All

these aspects combine to make the decision-making process, in the hands of managers alone, sub-optimal.

As described in further depth later, Chesborough articulates the point well: "Innovation is too important to let either corporate politics or outmoded assumptions carry the day."[2] Organizations, by their very nature, possess hurdles that can short circuit innovation. Therefore, it is important to embrace models that circumvent the hurdles. What Stage Three of the *Collective Innovation* process yields are the most promising ideas decided by those participating in the community, those closest to the customer, and those intimately knowledgeable about the product and competition. If properly generated, the list is objective, unencumbered by individual biases. Prediction markets are one of the best tools to power the idea prioritization process, to capture distributed and unbiased opinions and aggregate them effectively.

Prediction Markets

A prediction market is an example of a *Collective Innovation* tool that can generate the desired rank ordered list of ideas exiting Stage Two. A prediction market is similar to a stock market, but instead of trading the stock of a company, participants trade stock in any number of contracts. These contracts can be business ideas – which is the focus of this discussion – or the outcome of a political election or perhaps the sales volume for a particular product. Market participants buy and sell contracts based upon their analysis of their private information (or tacit knowledge) and are rewarded when they buy low and sell high.

All prediction markets trade contracts that represent uncertain future events. Who will be the next president? How many printers will a company sell next quarter? What is the best project for a company to pursue to achieve its organizational goals? These are all events whose outcome is unknown but the answers to which are valuable. Therefore, if an individual gains

more clarity about the probability of a potential outcome, he or she is in a better position to make decisions.

In our case, a manager using the collective insight of a large group of informed individuals can make a well-informed decision about which projects to pursue. This is because the active trading of market participants pushes the price of a stock up and down accounting for all the competitive dynamics including other companies, products, capabilities and environments. If incentives and instructions are carefully constituted, as described later, this is, quite literally, the collective's guess of an idea's potential for success relative to other ideas.

The following are several brief descriptions of real world examples of prediction markets. They include three commercial applications, companies that incorporate markets to gain competitive insights, as well as one market that focuses on the outcome of political events such as elections or nominations.[3] Some examples of the use of prediction markets follow.

Hewlett Packard

In 2003, Hewlett Packard employees traded stocks in an internal prediction market to forecast monthly computer sales. Here is how Time Magazine's Barbara Kiviat described the process:

> A few dozen employees, who were primarily product and finance managers, were provided trading accounts with approximately $50. With these funds they were asked to bet on what they thought monthly sales would be. For example, if a manager thought that next month's sales would be between $201 million and $210 million, he would buy that stock. If he came across new information and changed his opinion, he could sell that stock and buy another to reflect his refined analysis. When trading stopped, the scenario behind the highest-priced stock was the one the market deemed most likely. The traders got to keep their profits and won an additional dollar for every share of "stock" they owned that turned out to be the right sales range. Result: while HP's official

forecast, which was generated by a marketing manager, was off 13%, the stock market was off only 6%. In further trials, the market beat official forecasts 75% of the time.[4]

Iowa Electronic Markets

Another example, and one of the first prediction markets to gain recognition, is the Iowa Electronic Markets (IEM).[5] The IEM are a group of markets run by the University of Iowa for research purposes and feature traders betting on political elections and macroeconomics. For example, in a political election year, traders might bet on futures contracts such as: Al Gore will win the Presidential Election, paying $1 if Gore wins and $0 otherwise. With the bounds of $0 and $1, the price directly reflects the market's opinion of the probability that Gore will win. That is, if the price is $0.63 then the market thinks there is a 63% chance that Gore will be the next president.

Rite-Solutions

Rite Solutions, in many respects, is the most notable real life example because it is an ongoing market that is not tied to an actual event. As described in detail in Appendix D, there is not an actual date when an answer to a Rite-Solutions question is resolved, unlike that of the IEM or Hewlett Packard examples. Rather, the Rite-Solutions market continually tracks potential ideas which employees both submit as stocks as well as trade them to determine the strategic direction of the company. When the company formally selects an idea as a project, its stock is de-listed and the idea itself moves forward in the formal channels.

Consider the following process. Employees think of incrementally or disruptively innovative ideas and if they can garner enough support from their peers, those ideas are securitized and placed in the market to be traded and valued by their colleagues. The trading occurs continuously and management utilizes the unfettered information to observe what the employees think are the most promising product initiatives that the company should pursue. Moreover, senior management makes no judgments or analysis and uses this information to

direct resources. The only constraints placed on this market are the funds and hours available to devote to the projects. Appendix D describes the Rite-Solutions approach and its nuances in greater detail.

Eli Lilly

In 2003, pharmaceutical giant Eli Lilly launched its e.Lilly project to test the power of a predication market to estimate the likelihood of drug candidates passing stage two of the FDA approval process. Here is how U.S. News and World Report's James Pethokoukis described the effort:

> Last year, Lilly ran an internal market experiment where instead of using the public as its pool of potential traders, the company tapped about 50 employees--chemists, biologists, salespeople--to trade contracts representing six hypothetical drugs. The object was to figure out which ones had the best chance of making it to the next phase of clinical trials. Participants used drug data from real compounds that the market's organizers would slowly leak out. As it happened, the three highest-trading drug candidates were, in real life, the three successful drugs, while the lowest-trading ones were trial failures. Asked if he was impressed by the outcomes, Alph Bingham, head of R&D at the company's entrepreneurial e.Lilly initiative, says, "Let me put it this way: We're not abandoning the experiments."[6]

Types of Prediction Tools

Within the realm of what are known as prediction markets or information markets, there are numerous market variations (as is evident by the few examples we have provided above). Despite these variations, they are all based on the assumption that market forces – supply and demand – efficiently aggregate all public and private information into a stock's price. Stock prices can thus provide a manager with the necessary information to make strategic decisions informed by the collective opinion.

What are the general types of predictive tools? They consist of simple averages, weighted averages, democratic voting methods, as well as stock markets. The following are descriptions of each:

Simple Averages

As the name suggests, simple averages take all the answers of individuals in a pool and average them across the number of submissions. All participants get equal weighting in their submissions. Suroweicki provides one of the clearest examples in which visitors at a country fair could enter a contest to guess the weight of an ox.[7] The simple average of the 787 unique guesses by the crowd provided an answer of 1197 pounds and once weighed, the weight of the ox was found to be 1198 pounds.

Democratic Voting

In addition to the Digg.com approach of ranking noted previously, probability markets and pure prediction markets are examples of democratic voting solutions.

Probability Markets

Probability markets are much like the aforementioned Iowa Electronics Market. This can be a real-money or fake-money market in which "stocks" are bought and sold, yielding a fair market price. In this particular case, the price remains in a range between 0.0 and 1.0 reflecting the probability of a particular outcome.

Pure Prediction Market

A pure prediction market is a futures market. Buyers and sellers trade stocks using real money and generate a value of the stock via the stock price. The relative values of the stocks, when compared to each other, provide a rank order of the overall market. Rite-Solutions' "Mutual Fun" is the closest example of a pure prediction market in the sense that it is continuous and prices are not bound (See Appendix D).

Evidence of Prediction Market Accuracy

The benefits of a prediction market and similar tools are many. What is arguably the most important matter is the accuracy of the forecasts. Yet we also suggest that the benefits to organizational culture, as described later, may yield a secondary of benefit.

First in the minds of researchers and practitioners using prediction markets is the accuracy with which they forecast the outcome of future events. The results are particularly interesting as they compare to more commonly-used forecasting methods. While additional rigorous studies are needed to draw more compelling conclusions, the majority of academic analyses to date have observed that prediction markets are as good as traditional methods, and some studies argue that they are significantly better.[8]

Anecdotal evidence of their accuracy has generated significant interest in prediction tools and an increasing array of organizations experimenting to test their usefulness for different applications. Our research, primary and secondary, has confirmed the use of prediction markets by dozens of companies including: Corning, Eli Lilly, France Telecom, Google, General Electric, Hewlett Packard, Intel, Microsoft, and Siemens.

Making Sense of Market Activity

Stage Three of the *Collective Innovation* process suggests that an organization should place the ideas exiting Stage Two into an internal prediction market or some other mechanism. Employees should participate in the mechanism such that their decisions rank order the list of ideas.

Once a market is up and running, managers must then use the data reflected by stock prices. As economists have suggested for decades if not centuries, prices produced in a freely traded market convey remarkable insights to traders and students of the market. The question

remains how does one derive precisely what price is saying about a particular stock? How is that relevant to other stocks? The same conundrum is true of managers using internal markets for similar purposes. What are a manager's employees saying by valuing one initiative over another especially when it runs contrary to what senior management favors?

While there is no one right answer to this question, our research has revealed some "best practices." One key point is that markets are exceptionally valuable but also are subject to anomalies. This is true of real markets, such as the NASDAQ and NYSE, as irrational buying can drive "bubbles" such as the famous Internet boom, leading to fire sales that erase billions of dollars of value when bubbles burst.

Internal markets are subject to these challenges as well, but they are less frequent, less dramatic, and are relatively easy to avoid. The following recommendations are provided to assist managers in reading and understanding stock prices.

Stock Analysis Over Time

Time is the manager's friend when it comes to analysis of internal markets. The relative valuations of stocks in the immediate days after launch are interesting but usually not useful. This is because the market's self-correcting mechanisms are in their early stages adjusting prices for all the activity and achieving liquidity. Therefore, managers should encourage participation but not obsess in observing minute-to-minute and day-to-day changes in price. The value comes when all participants weigh in, spend their money, and communicate their distributed knowledge.

Moreover, there is a learning curve. Many participants will require some time to discover the rules of the game and how best to play. The reality is that there may be many participants who are not familiar with trading in any type of market, let alone a prediction market. Therefore,

some training and time must be allowed. There may also be those who attempt to game the market, but current research suggests that those people are few, the risk is small, and the means to correct or eliminate them is easy. As one executive said in our interviews, "the risk is small and the benefit clearly outweighs it."[9]

Rank Ordered Lists

Managers should also generate rank ordered lists. There are many different lists that a manager can generate from the data in a market and each conveys different information. For example, there are the stocks with the largest gains and losses, indicators that can be based on absolute stock price and relative gains and losses. A variant is to track the largest gainers and losers by volume of shares traded. These cases can reveal significant information, but generally the salient points fall into two categories.

First, the volume gainers can point to a stock that is in the bottom quartile of value but has generated considerable interest among traders - these are stocks that a manager should note because they may represent great ideas in their early stages of development. If managers make the list over long time frames, such as a week's or a month's biggest gainers, they may not be identifying fads or small bubbles. On the flip side are the stocks that lose the most value. The information that these stocks' prices communicate is the confirmation that these are projects that should not be pursued or if they are already under development, management should revisit the question of continuing to fund their development.

Market Indicators

Another tool that organizations can borrow from real markets is the idea of leading and lagging indicators. Real markets often rely on outside information such as interest rates, housing starts, employment rates, as indicators, but the analogy is useful here. Managers can potentially use indices which are aggregated stocks based on common tags or some other grouping mechanism to gain insight into the trends of the market. For example, a group of

stocks that all share the tag of "wireless" could serve as an index and an indicator of what the next area of interest for the firm might be. While this does not precisely correspond to the definition of leading or lagging indicators in the economy, the usefulness to managers remains the same.

Other Patterns

Other patterns of information include the grouping of participants and the general sentiment, if any, that exists with them. Consider that an analysis of a particular stock's performance revealed that a large number of customer-facing employees were buying the stock in quantity. This might suggest a future need for a key customer segment. There is also a method called "Bayesian Truth Serum" that focuses on a subset of individuals in a market to predict future events and research shows it to be effective.[10] While some of these patterns may offer value, managers need to be aware of the nuances of their markets.

Dormant Stocks

What about the other side of volume gainers and losers? What does a manager do with the stocks that are not traded? One might think that culling these dormant stocks is a worthwhile activity as it makes room for other more valuable ideas. Consider, however, cases of disruptive innovation.

There are cases in which dormant stocks are not actually without value. They may simply be without value now. Competitive environments change, technologies undergo breakthroughs, and political winds shift. Relevant examples of technologies developed before their time abound - consider the personal computer and transistors in a time of vacuum tubes, or the iPod in a market flush with MP3 players but without a service such as iTunes. These examples are ideas that have significant value but might not draw interest until an exogenous factor dramatically changed the circumstances and value of the idea. Along these lines, dormant stocks may thus be of some value but not at the present time.

One way around this dilemma is for managers to implement a random recommendation engine to circulate the dormant stocks and get a fresh assessment. Another is to assign responsibility to some individuals to periodically review dormant ideas. Regardless of the approach, it is important to set a relatively high bar before delisting any idea from the market. The cost is low to keep them and the potential upside, far outweighs this cost.

From Prioritization to Capitalization

During Stage Three, a large number of ideas are ranked according to the collective's judgment as to how valuable the ideas are to the organization. In this section, we reviewed how important it is for management to be aware of the systemic biases that currently exist and actively manage the environment to encourage participation and information exchange. We discussed the power of anonymity in overcoming status inconsistencies and other organizational structure issues. We also brought to light the role that time can play, particularly when a market has a specific end like those operated by Hewlett Packard and IEM or when it is continuously played as in the case of the market operated by Rite Solutions. Like all Collective Innovation tools, prediction markets and similar tools can create significant value for managers but must be used with caution.

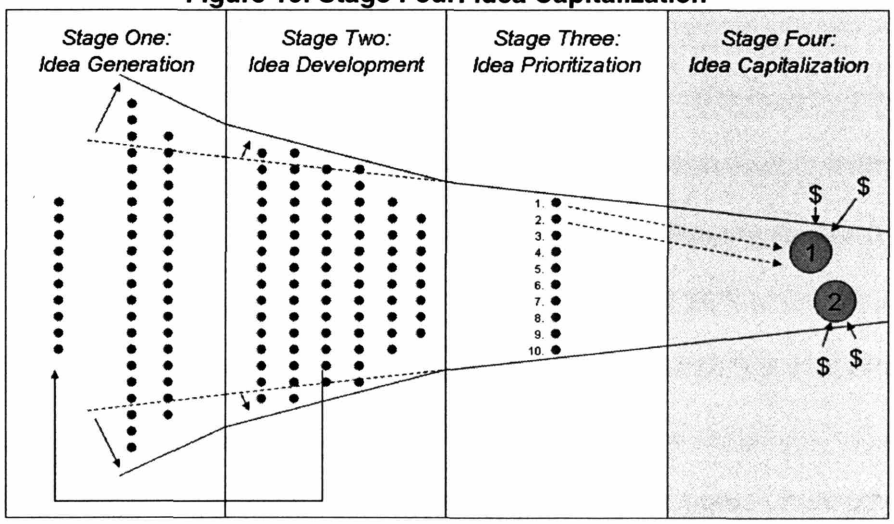
Since innovation has no value if an organization can not leverage the ideas to create value and then capture that value, the ideas exiting from Stage Three must now be allocated resources and brought to market – the job of Stage Four, Idea Capitalization.

Stage Four: Idea Capitalization

The thoughts generated by Stage One were developed into ideas during Stage Two and prioritized in Stage Three. The ideas at the top of the priority list now exit Stage Three and enter the final stage of the *Collective Innovation* process, Stage Four. Innovative ideas are worthless

to an organization if that organization cannot generate value through those ideas and then capture at least a significant portion of that value, Stage Four (See Figure 16) is concerned with how an organization can leverage the power of the collective to allocate resources to ideas exiting Stage Three.

Figure 16: Stage Four: Idea Capitalization



The Strategic Planning Process

Katz offers an excellent perspective on the approach that management should take which he refers to as an "open market for capital":

> Rather than designing control and budgeting processes that weed out all but the most comfortable and risk adverse ideas, the organization needs to think more like a venture capitalist and permit investments in experiments and unproven markets. Individuals or teams experimenting with small investments and unconventional ideas should not have to pass the same screens and hurdles that exist within the large established business. The goal is to make sure there are enough discretionary resources for winners to emerge – not to make sure there are no losers.[11]

Katz describes an approach to the strategic planning process that fits well with the goals of *Collective Innovation*. The vast majority of organizations, however, pursue a traditional strategic planning process. In these organizations a few senior managers, with the charge of

allocating capital to the most appropriate strategic initiatives, sit in boardroom and hash through the details of exactly how the company's operating capital will be spent. This is a non-trivial process to be sure - it is critically important to the company and has direct impact on how employees at all levels of the firm spend their time. It is also one in which the collective offers an interesting and potentially powerful alternative.

Why does senior management not simply select all the projects on the list yielded from Stage Three until the constraint of operating funds no longer permits further investment? There are, of course, financial arguments in which projects could be grouped together with their total net present value greater than that of simply the top ten – for example, projects A, C, and D may be more valuable that A, B, and C. We recognize this scenario. For the sake of simplicity, we assume that management takes such matters into account. If the process up to this point has accurately captured all information relevant to the projects, the choice for management is simple in the end.

Collective Resource Allocation

While conventional wisdom holds that organizational management alone should decide which ideas should be allocated resources and brought to market, Stage Four suggests an alternative approach in which ideas are allocated resources by the employees who participated in the ranking effort.

Assume that an organization is growing quickly and several projects are being pursued simultaneously. The company is becoming constrained for workspace, particularly group workspace such as conference rooms. Several projects are important to the successful growth of the company but what happens when two or more are in need and there is only limited space available? What group receives preference? Management cannot be involved in all these decisions nor does it necessarily want to use political clout or informal relationships to determine

how the conference rooms and other scare resources are spread across the various groups. The time and effort spent by project managers coordinating conference rooms are better spent adding value and moving the project forward. Perhaps a simple alternative is available such as an auction. Consider the option in which each team is allocated a certain number of points each month and the team members can use those points to bid for conference rooms. Such a system is simple, brief, and extracts the true value of the conference room, at that point in time, to all teams bidding on it.

Perhaps the most interesting, practical, powerful example of resource allocation is the use of auctions to allocate resources in a labor pool. Thomas Malone posits what a work environment in the future will look like as the costs of communication decreases to towards zero. Through case studies and thought experiments, Malone discusses the specific implications of such a world. In one example, Malone describes the structure and processes of a firm in which there exists an internal labor market:

> [The project] review board, for example, might allocate to each approved project a sum of cash that the project leader could use to bid for team members. If a leader thought a particular person was critical to a project, for instance, he or she could use a lot of the budget to bid for that person, even if the project wasn't a very high priority for the company. By the same token, people who wanted to be part of a project or had no other projects to do at the moment might accept lower fees than they usually receive. Each potential team member, as well as each people manager, would in effect become a profit center, seeking to maximize his or her income. At the end of the year, the profits that team members and people managers had accumulated in their profit centers would affect their pay, their recognition, or other rewards. In this way, everyone is motivated to do whatever is most valuable for the organization at any point in time. And that, of course, is the true goal of human resource management.[12]

In addition to the efficiencies squeezed out from using markets, there also important cultural implications and Katz teases out an interesting example:

> Organizations should create an internal auction for talent across the different businesses and opportunities. The organization's professional and leadership talent cannot feel that they are locked inside moribund, mature businesses. Instead, they must have the chance to try out something new, to experiment with an idea, or to proceed with their imaginations. With more fluid boundaries inside the organization, people can search out and follow through on the most promising new ventures and ideas by voting with their feet.[13]

What Katz describes here is not a labor market as we traditionally envision it but an auction. Katz mentions how releasing employees from the constraints of restrictive processes can yield valuable results. In short, by allowing people to "[vote] with their feet", the "most promising new ventures" are pursued because it is inherent in the process.[14] By giving the decision making power to employees, each individual makes best use of his or her time and skill set rather than burdening management with these decisions.

Creating and Capturing Value

In Stage Four, the final stage of the *Collective Innovation* process, the ideas ranked highest by the collective in Stage Three are allocated resources and executed. Stage Four suggests that organizations should consider just how markets or auctions can be used to allocate resources to projects.

The scope of resources that might be allocated in this way is expansive. Aside from capital, conference rooms, and labor pools, the collective can allocate resources such as server time, manufacturing capacity, and marketing collateral. In fact, this approach can apply to the figurative raw materials of business which include labor, computing resources, and anything else necessary to conduct everyday business. As long as managers are cognizant of

Huberman's advice to account for the "human element" when designing the architecture of tools and processes, the applications are endless.

The *Collective Innovation* process, described during this chapter and the previous two, is built upon a foundation of our own primary research as well as second research and academic teachings. In theory, the strategy we present here should enable organizations to improve their ability to innovate successfully, repeatedly, while avoiding some of the greatest barriers to innovative ideas, particularly those radical or disruptive.

While no organization has implemented the complete *Collective Innovation* process to this point, a number of organizations are successfully pursuing exploration strategies that implement components of the process. From our research, along with interviews with those organizations, it is clear that the implementation of *Collective Innovation* requires that organizations pay significant attention to how their own resources, processes, and values will either accelerate such a strategy or inhibit it. In addition, the success or failure of *Collective Innovation* is tied deeply to the particular dynamics of organizational politics and culture. The next two chapters survey the myriad array of organizational issues with which management must contend during an implementation of *Collective Innovation*.

[1] http://www.mit.edu/~djenter/Research.htm (Accessed 12:10pm, 4/23/07)
[2] Chesbrough, H., (2005). *Open Innovation.* Boston: Harvard Business School Press.
[3] For a more detailed analysis of prediction markets, see: Wolfers, J. and Zitzewitz, E. (2004) *Prediction Markets* Journal of Economic Perspectives; Spring2004, Vol. 18 Issue 2, p107-126
[4] http://www.time.com/time/magazine/article/0,9171,660965,00.html (Accessed 3:58pm, 4/22/07)
[5] http://www.biz.uiowa.edu/iem/ (Accessed 4:59pm, 4/22/07)
[6] http://www.usnews.com/usnews/biztech/articles/040830/30forecast_print.htm (Accessed 4:11pm, 4/22/07)
[7] Surowiecki, J., (2005). *The Wisdom of Crowds.* Garden City: Anchor. p. xiii
[8] Servan-Schreiber, E., Wolfers, J., Pennock, D. M., & Galebach, B. (2004). Prediction markets: Does money matter? *Electronic Markets, 14*, 243-251; Wolfers, J. and Zitzewitz, E. (2004) *Prediction Markets* Journal of Economic Perspectives; Spring2004, Vol. 18 Issue 2, p107-126; Pennock, D. (2001) The Real Power of Artificial Markets *Science*, 291: 987-988, February 9, 2001; Gjerstad 2004;
[9] Authors interview with Rite-Solutions CEO, Joe Lavoie, on March 29, 2007
[10] http://cipd.mit.edu/documents/publication_files/prelec2004science.pdf (Accessed 5:06pm, 4/22/07)
[11] Katz, R., Editor, (1997). *The Human Side of Managing Technological Innovation.* Oxford Oxfordshire: Oxford University Press. *Managing Technological Innovation in Organizations* (Ralph Katz), p. 688.
[12] Malone, T., (2004). *The Future of Work.* Boston: Harvard Business School Press. pp. 94-95
[13] Katz, R., Editor, (1997). *The Human Side of Managing Technological Innovation.* Oxford Oxfordshire: Oxford University Press. *Managing Technological Innovation in Organizations* (Ralph Katz), p. 688.
[14] Ibid.

Chapter Seven: Organizing for Collective Innovation

> Our fourth enabler, *create the right context*, involves organizational structures that foster solid relationships and effective collaboration. As knowledge and innovation become more central to competitive success, it is no surprise that many executives have grown dissatisfied with traditional organizational structures. Since the mid-1980s, corporations have begun transforming themselves through a variety of alternatives...[in] an effort to devise new structural forms that offer an unprecedented level of flexibility and adaptability. In other words, traditional organizational charts, with their rigid hierarchies and vertical integration, can no longer coordinate business activities in a world where boundaries are fuzzy, relationships are ever more complex, and the competitive environment is in constant flux.[1]

In theory, implementing a strategy of *Collective Innovation* should enable an organization to generate, develop, prioritize, and execute innovative ideas more often and with greater impact. In reality, however, organizations are extremely complicated. Every organization features a unique foundation of political, cultural, and strategic dynamics upon which a new exploration strategy must lie. As described previously, there are significant differences in approach and philosophy between *Collective Innovation* and traditional organizational approaches to innovation. Given these differences, most organizational foundations will initially generate barriers to the implementation of *Collective Innovation* and indeed, many organizational foundations may make the implementation of such a strategy virtually impossible without significant care and consideration.

Using a car for a metaphor, *Collective Innovation* is the engine and the organizational foundation is the driveshaft, connecting the power of the engine to the wheels and the road. Without a driveshaft compatible with the engine, a car will fail to function. Similarly, without a compatible organizational foundation, a strategy of *Collective Innovation* will be unsuccessful. In order to devise the implementation strategy that offers the greatest chance of success,

management must fully understand how the structure and hierarchy of the organization, the power dynamics within the organization, and the culture of the organization might accelerate or inhibit *Collective Innovation*.

In order to fully understand the dynamics that must be considered to make an implementation of *Collective Innovation* successful, it is instructive to view the organization foundation through a pair of frameworks: *Resources, Processes, Values* (RPV) and *The Three Lenses*.

Resources, Processes, Values (RPV) Framework

Developed by Clayton Christensen in the late 1990s, the RPV framework is valuable when analyzing organizations at a general level. Christensen defines resources as "...usually *things*, or *assets* – they can be hired and fired, bought and sold, depreciated or enhanced. They often can be transferred across the boundaries of organizations much more readily than can processes and values."[2] Processes are "...the patterns of interaction, coordination, communication, and decision-making through which [organizations transform inputs into products and services of greater worth] and finally values "...are the criteria by which decisions about priorities are made."[3] Through their research into organizational innovation, Christensen and others explain that resources can often be shifted between organizations without any impact on the value of those resources. On the other hand, processes and values are very delicate and can easily be altered if shifted from one environment to another.

Consider the following scenario – one company is intent on acquiring a second company and in particular, desires to take advantage of that company's assets. In most cases, the first company can acquire the second and integrates the assets of the second company into its existing operations without negatively impacting those assets.[4] Now, consider a scenario in which one company is intent on acquiring a second company, but this time, desires to use its

processes and values. Given the delicate nature of processes and values, any attempt to integrate the second company into the first company could easily result in an infection of its processes and values by the processes and values of the acquirer. In other words, if the first company proceeds with any course of action other than allowing the second company to remain a distinct, separate subsidiary, it runs the risk of destroying the very processes and values for which it carried out the acquisition in the first place.

As discussed in Chapter Three, organizations face the challenge of exploiting (delivering products and services to customers) while simultaneously exploring (seeking out the improvements, ranging from incremental to radical, that will serve the organization well in the future). Viewed through the RPV framework, exploitation requires processes and values that are often diametrically opposed to those required for exploration. In other words, the processes and values that may enable an organization to optimize its exploitation processes, exist in opposition to the processes and values that will enable an organization to optimize its exploration processes. Specifically, successful exploitation requires streamlining, standardizing, structuring, and the removal of as many variables as possible from the product or service delivery process. Successful exploration, on the other hand, requires flexibility, freedom, creativity, randomness, and the creation of a safe environment comfortable with variability and partially-formed ideas. Many of the organizations most successful at exploitation often struggle with exploration.[5]

Research reveals that for most disruptive innovations to be successful, they require processes and values quite different from those that drive the existing product, process, or service that that innovation may disrupt.[6] When contemplating bringing a disruptive innovation to market, Christensen and others recommend, for example, that an incumbent organization consider creating a separate organization to develop the disruptive innovation, thus allowing its processes and values to develop without the potentially destructive influence of the parent

organization's processes and values. Of note, Christensen cites Hewlett-Packard's successful decision to create a new, separate organization to bring ink-jet printer technology to market, lest it be destroyed prematurely by the processes and values of the dominant laser jet printer technology if it were to remain in the same division.[7]

In so far as *Collective Innovation* is designed to power the exploration process, it is essential that organizations think carefully about their dominant processes and values and how they might positively or negatively impact *Collective Innovation*. In the next chapter, we suggest four possible organizational strategies for implementing *Collective Innovation* and investigate just how resources and processes may accelerate or inhibit *Collective Innovation* in each scenario.

The Three Lenses Framework

The Three Lenses framework is useful when investigating organizational foundations at a more granular level than the RPV framework. Indeed, organizations are a collection of human beings and successful *Collective Innovation* requires those human beings to be motivated to assist organizational exploration. As a result, managers must carefully consider how those human beings are grouped together, linked to each other, and how their efforts and goals are aligned to the goals of the organization. In addition, organizations must pay careful attention to the dynamics of power and politics and of culture and behavior norms within their walls.

In 2005 a group of MIT professors created *The Three Lenses*, a framework valuable to the study of organizations.[8] *The Three Lenses* asserts that organizations can be viewed as strategic systems, as political systems, and as cultural systems. All organizations are comprised of these three systems at any moment in time and each of these three systems, depending upon how it is constituted, can have a positive or negative impact on the success of *Collective Innovation* (Table 3 provides an overview of *The Three Lens* framework).

Table 2: Three Lens Matrix

Lens	*Strategic*	*Political*	*Cultural*
Key concepts	Formal structure ("the boxes," business processes), systems (info systems, human resource management, etc.)	Power and influence, social networks, interests, dominant coalition	Identity, traditions, shared mental maps, cultural artifacts, values and assumptions
Key processes	Grouping, linking, aligning, external fit	Conflict, negotiation, forming (dissolving) relationships	Meaning and interpretation, legitimizing, rhetoric, setting norms/rules of conduct
View of Environment	Opportunities and threats	Stakeholders	Social and cultural network, institution
Role of leader	Organizational architect, strategist	Building coalitions, identifying and leveraging interests, negotiating and resolving conflicts	Articulating vision, build and manage culture, symbol of culture
Stimuli for change	Lack of internal integration, lack of fit between organization and environment	Shifts in dominant coalition, in power of stakeholders	Challenges to basic assumptions, contested interpretations
Barriers to change	Inadequate analysis, inadequate information	Entrenched interests	Dominant culture

Strategic Design Lens

Through the strategic design lens, organizations are viewed as machines, as systems designed to achieve specific goals. The components of the system must fit together and actions are planned ahead of time. The strategic design lens examines the formal structure of the organization, such as the personnel flow chart, and the systems used by functions within the organization, such as information and employee resources planning systems. Within the strategic design of an organization, there are four key processes: Grouping (how individuals are organized within the organization), Linking (how individuals and information are connected and exchanged within the organization), Aligning (how incentives are matched to the goals of the organization), and External Fit (how well the organization is constructed and performing in the context of its environment). The strategic design lens considers the threats and opportunities within the organizational environment. The strategic design lens also views the leader of the organization as an architect and as a strategist. Finally, when viewed through the strategic

design lens, conflict between internal components or between the organization and its environment act as stimuli for change while a lack of information is most often a barrier to that change.

Grouping

> To begin with, decisions about local problems should be made, as much as possible, by people close to the problem...Instead of assuming that all problems need to be filtered up the hierarchy and ever solution filtered back down again, companies should start with the assumption that, just as in the marketplace, people with local knowledge are often best positioned to come up with a workable and efficient solution.[9]

Within the Strategic Design lens, the grouping process deals with how individuals are organized within the organization. To be successful, *Collective Innovation* requires that organizations think carefully about how they gather individuals together and indeed, requires that organizations call into question some of the most central ideals of organizational structure.

Dangers of a Command-and-Control Structure

The typical organizational structure has much in common with the structure favored by the military, a command-and-control type of approach. Some have suggested that the ideals of organizational structure draw their roots from the Prussian Army as constituted in the 18th century. The Prussian Army was organized first into four corps. Each corps was organized into four brigades. Each brigade was organized into three regiments. Each regiment was organized into three battalions. The overall Prussian Army was led by a Field Marshall and his staff, to whom the commanders of each corps reported, to whom the commanders of each brigade reported, and so on. Today, the U.S. Army is organized similarly, with corps, divisions, brigades, battalions, companies, platoons, and squads making up the hierarchy in descending order of size. Each element of the hierarchy includes its own hierarchy of command.

Military forces are tasked with the job of completing missions and achieving objectives in severe circumstances. To do their job, military forces are often comprised of tens or hundreds of thousands of individuals, all of whom must be organized and directed with as much efficiency as possible. Indeed, the ultimate goal of the military structure is to stamp out variability as variability leads to situational fluctuation and uncertainty, both of which can have negative consequences, particularly in battle. In essence, the organizational process of exploitation for a product or service-producing firm, of achieving a specific goal as efficiently and predictably as possible, shares much in common with the military. Now, consider the RPV framework analysis. Structure and bureaucracy often support exploitation, while inhibiting exploration. Creativity requires variance and flexibility. Traditional organizational grouping strategies often form the greatest challenge to organizational innovation and indeed, organizations must consider how they might relax or alter such grouping strategies if *Collective Innovation* is to work. As noted previously, Chapter Eight will suggest grouping strategies which support *Collective Innovation.*

Dangers of 'Groupthink'

At a lower level, successful *Collective Innovation* requires that organizations view themselves as large groups of individuals, individuals with diverse sets of experience, skills, and tacit knowledge which can be collectively harnessed to the benefit of the organization. As Surowiecki notes, "...the presence of a minority viewpoint all by itself, makes a group's decisions more nuanced and its decision-making process more rigorous...even a single different opinion can make a group wiser."[10] Now consider the concept of an 'information cascade'. An information cascade, also known as 'groupthink', occurs when individuals observe other individuals taking a single action and then, take the same action as those other individuals, even if they have personal information that suggests the action in question is incorrect. To this point, variation and minority viewpoints are essential in protecting against information cascades.

In our earlier discussion of 'diversity', Albert Shapero recommended that organizations "...make up project groups to include people of different backgrounds" and to "over time, add new people to successful teams" such that viewpoints, which may have become increasing dominant, are questioned.[11] We believe it critical for organizations to understand the tendencies of team dynamics and how naturally individuals working on the same team or in the same function will develop similar perspectives and viewpoints. Organizations must take steps to infuse teams with variance and diversity, even those that may be high-performing.

Linking

Within the Strategic Design lens, the linking process deals generally with how communication and information flow within the organization. Communication and information tools, ranging from Internet applications to internal market and knowledge management systems, are critical to *Collective Innovation*. Information mobility and the ability of individuals to communicate easily and efficiently with each other, in both synchronous and asynchronous fashion, are important considerations as well.

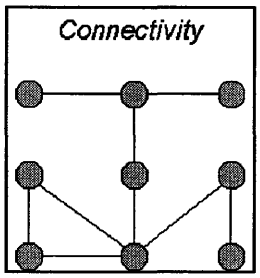
Value of Connectivity

One of the unique elements of *Collective Innovation* is how individuals, thoughts, and ideas are connected throughout the entire process. In addition to simply sourcing a wide range of individuals internal and external to organizations to generate a significant quantity of ideas, *Collective Innovation* connects those individuals together to collaboratively develop, prioritize, and execute ideas.

Connectivity, when discussing graphs or networks is a measure of the degree to which the nodes in the network are connected. One could think of it as "how many steps does it take to reach any given node?" In Figure 17, the shortest distance that connects the nodes furthest from each other involves five steps. One example is moving from the node in the top left to the

bottom right which traverses five nodes in route. The application in the context of *Collective Innovation* is similar and emphasizes the flow of information between nodes.

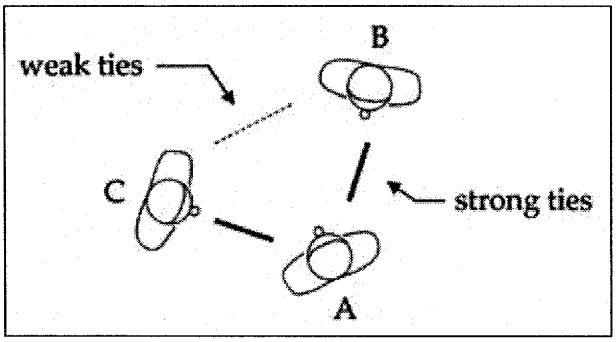
Figure 17: Connectivity



The degree of connectivity between individuals is important. It dictates, for example, how easy it might be for an information cascade or groupthink to occur as the more closely individuals are connected, the greater the probability that they will fall into such traps. The degree of connectivity is thus tied closely to the goal of achieving diversity of thought across people in a group since increasing diversity reduces the potential for information cascades or groupthink. Through intentional design or contextual observation, managers must note if and when more or less connectivity is required during the innovation process.

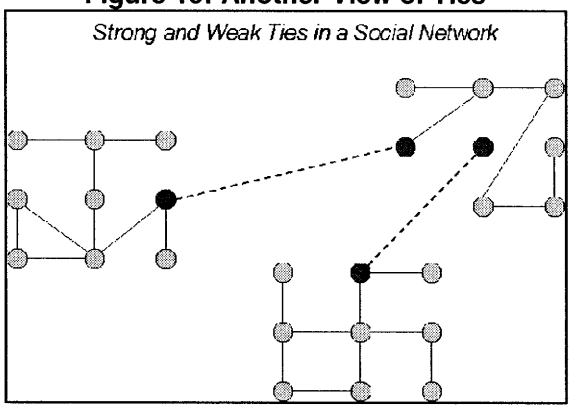
A related notion is the presence of strong and weak ties in a social network.[12] If a group of individuals spend time together and share information frequently enough that the information is held by each member of the group, the individuals within the group are considered linked by 'strong ties.' As described in Figure 18 and Figure 19, 'weak ties', on the other hand, occur when individuals are indirectly connected to other individuals or when groups are linked to other groups by single relationships. According to research, new information, opinions, and potentially novel ideas to approach problems can be introduced to a group through weak ties with individuals who do not share the common information or dominant perspective of the group.[13] In general, the more weak ties, the better.

Figure 18: Strong and Weak Ties[14]



Clearly, the dynamic of ties internal and external to the organization have tremendous implications in the innovation process, and the performance of *Collective Innovation* process is highly influenced by just how people are connected. Managers must recognize that it is important for connectivity between individuals to exist, but that an abundance of strong ties may have a pronounced negative impact on the innovation process.

Figure 19: Another View of Ties



Value of Informal Networks

Successfully *Collective Innovation* requires that organization consider the power and importance of informal networks as well as formal networks. Formal networks are official pathways of communication, information, and authority, such as the organizational hierarchy. Formal networks may dictate, for example, that employees should only approach their direct manager for permission or information and not their manager's manager or another manager. Formal networks often create closed, vertical silos within organizations. In contrast, informal

networks are communication and information pathways built through friendships, "water-cooler conversations", and reputations. While formal networks may support the goals of 'command-and-control', informal networks often represent more efficient pathways for employees who know, through back channels, to whom they should go for knowledge on specific topics, who they can trust, and in general, who might be able to help them the most. *Collective Innovation* requires that organizations allow and promote the use of informal networks, a process that increases the sense of community within the organization and also allows for the stimulation of new ideas through network diversity.

Value of Hiring

Human resource processes, such as hiring and recruiting, are essential linking mechanisms and play a significant role in determining the ultimate effectiveness of *Collective Innovation.* Individual human beings lie at the core of collective intelligence and thus, at the heart of *Collective Innovation. Collective Innovation* thrives when it draws upon individuals who are energized, passionate, and intrinsically motivated to accomplish the particular tasks of the organization of which they are members. Indeed, before *Collective Innovation* can even be implemented as a strategy, it is essential for organizations to consider just how effective they are at attracting creative, intrinsically motivated individuals. As Katz writes, "...the presence of motivation does not guarantee high performance and success, [but] its absence seems to result in long-term problems."[15] Of particular note, Katz also emphasizes "...the importance of having technical professionals with A-rated motivations and B-rated capabilities rather than the other way around."[16]

Collective Innovation requires that organizations recruit individuals who are comfortable with dissent and divergence of opinion and who will work well within teams, but also have the confidence to both develop and support ideas that may seem risky or nontraditional. To these ends, David Maister cites the example set by McKinsey & Co., a firm that "...[invests] a

significant amount of senior professional time in the recruitment process…[leverages] psychologists…[and makes] significant investment in training programs."[17]

Value of Knowledge Management

Knowledge management is another important component to linking and for a *Collective Innovation* strategy to succeed, efficient knowledge management is essential. Since the harnessing of tacit knowledge is fundamentally a human issue, Richard McDermott recommends that organizations take a community-oriented approach, suggesting that organizations should: focus on knowledge important to both the business and the people, create forums for thinking as well as systems for sharing information, let the community decide what to share and how to share it, create a community support structure, use the community's terms for organizing knowledge, integrate sharing knowledge into the natural flow of work, and treat culture change as a community issue.[18] Through his research into the efforts of Shell's Deepwater Division, McDermott recommends that "…a knowledge management system [includes] both systems for sharing information and forums for thinking" and furthermore that those knowledge management systems be able to capture "…interpretations, half-formed judgments, ideas, and other perishable insights."[19]

Value of Engaging Organizational Alumni

Finally, organizations should also consider the value of the knowledge possessed by their own retirees.[20] When an individual retires from an organization, their knowledge leaves the organization with them. Even if an organization attempts to capture the knowledge of that individual before they depart, it is presently impossible to record an individual's experience, judgment, and values along with that knowledge - without experience, judgment, and values, for example, that knowledge is less valuable. *Collective Innovation* suggests that organizations consider how they might keep retirees involved, through markets, polls, and other tools that would allow their knowledge to be continually tapped in return for recognition and other rewards.

Aligning

> Whether dealing with monkeys, rats, or human beings, it is hardly controversial to state that most organisms seek information concerning what activities are rewarded, and then seek to do (or at least pretend to do) those things, often to the virtual exclusion of activities not rewarded. The extent to which this occurs of course will depend on the perceived attractiveness of the rewards offered, but neither operant nor expectancy theorists would quarrel with the essence of this notion. Nevertheless, numerous examples exist of reward systems that are fouled up in that the types of behavior rewarded are those which the rewarder is trying to discourage, while the behavior desired is not being rewarded at all.[21]

Within the Strategic Design lens, the aligning process deals generally with how incentives tie organizational resources, processes, and values to the overall goals of an organization. The aligning process also deals with the concept of 'incentives' and just how well those incentives are 'aligned' with the overall goals of an organization. Incentives, both financial and non-financial, are essential to the success of *Collective Innovation*. Specifically, from monetary bonuses and peer recognition to extra vacation time and prize drawings, organizational incentives are valuable tools that can be used to encourage individuals to participate in the stages *Collective Innovation*.

Danger of Incentive Gaming

Incentives often fail to have the desired effect, as noted in the quote at the beginning of this section from Steve Kerr's classic article, *On the folly of rewarding A, while hoping for B*. Often, individuals figure out ways to 'game the system' and achieve a bonus, for example, by following the literal requirements of the incentive, but not the spirit.

For example, consider what might happen if a worker is told that the more widgets she is able to construct in a given day, the more money she will receive. Naturally, the worker will strive to construct widgets more quickly, but in doing so, quality may suffer. If the incentive

requirements are considered literally, the organization will more than likely see a resulting increase in widget output, but that increase may be rendered worthless if the quality of the widgets decreases at the same time. Consider as well if the organization sets a standard pay rate for worker time during normal business hours and a higher pay rate for overtime. If such a schedule is left unqualified, workers will more than likely attempt to complete a good deal of their work outside of normal business hours.

This behavior has implications for *Collective Innovation* tools with built-in rewards, such as internal markets. When operating internal markets, managers must consider how employees might seek to maximize their own personal outcomes (e.g. by taking a big risk or by following the crowd) rather than acting in the best interest of the market and the organization (e.g. by trading in line with actually expectations for the predictions for which the market was created).

Danger of Incentive Misalignment

As noted in Chapter Three, the misalignment of incentives is one of the strongest barriers to successful, repeated organizational innovation. Organizations must consider the ways in which individuals have incentives to make decisions and take courses of action that may be in their own personal best interest, but not in the interest of the overall organization. Consider an organization that offers its employees bonuses if they participate in the *Collective Innovation* process (e.g. by vetting or developing ideas or by participating in an internal market). Consider if that same organization offers its managers bonuses if they are able to improve efficiency and optimization within a manufacturing process. If that manager finds his employee participating in *Collective Innovation* on company time, that manager will more than likely compel the employee to return his focus to efficiency and optimization. Even if the overall organization would ultimately benefit greater from that employee identifying new innovations, the manager will act rationally in accordance with his own personal incentive structure.

Collective Innovation, as well as organizational innovation in general, will fail if organizational incentives are not carefully aligned to the outcome that the organization desires.

Importance of Extrinsic and Intrinsic Motivation

Organizations must also consider carefully how different types of individuals are motivated and what incentive strategies should be put in place to build and maintain that motivation. Organizations often prioritize extrinsic rewards, rewards with monetary value, over intrinsic rewards such as peer recognition and satisfaction. Organizations must understand that intrinsic rewards are often as powerful as extrinsic awards when seeking to evoke a sense of individual commitment to and ownership of organizational exploitation and exploration processes from employees. To this point, managers must seek to strike a balance between extrinsic and intrinsic rewards and recognize that the optimal balance is different for every individual and for every task.

Consider the use of internal markets. As Surowiecki writes, "...one of the real challenges in putting things like internal markets in place inside, say, a corporation is figuring out exactly how rewards should work. You want people to care enough about the market to be serious in their forecasts, but not to care so much that they neglect their real work. Nor do you want the financial stakes in the market to be such that people are at risk of losing enormous amounts if their forecasts turn out to be wrong."[22] Surowiecki suggests that non-financial incentives can be as successful as financial incentives.

Through his research, Surowiecki compared the accuracy of predictions made by a 'play money' market, Newsfutures.com, with a 'real money' market, TradeSports.com and found that the predictions in the former were just as accurate as those in the latter.[23] According to Surowiecki, "...incentives almost certainly help [in internal markets], if only because the prospect of a gain (or a loss) helps concentrate people's minds, and for situation in which

relevant information may not be obvious…[incentives] do not need to be financial."[24] To this point, Katz writes "…researchers conclude that effective managers do not rely solely on the organization's formal reward system…instead, they employ a continual stream of informal rewards that they can deliver on a timely basis to generate employee excitement."[25]

Importance of Employee Time

A successful *Collective Innovation* strategy also requires that managers find ways to give individuals time to participate in the collective activities within the idea generation, development, prioritization, and resource allocation stages. Furthermore, managers must also ensure that those individuals enjoy their participation in these activities and do not view such a time commitment as an opportunity to waste time or as a burden. Consider what might happen if other companies attempted to replicate Google's decision to allow its software developers to spend one day per week of their work time (20% time) on personal projects. In organizations without Google's openness, culture, and management support of employees, employees might spend that 20% time 'relaxing', 'slacking', or working on projects completely outside the scope of the Company's business. Alternatively, developers might easily find themselves so busy with their normal workload that they must find additional time, outside the work week, to devote to personal projects. In these situations, if management does not pay careful attention, employee backlash might develop.

Importance of Accurate Rewards

Finally, managers must consider how they reward individuals who play valuable roles in the creation, development, and prioritization of ideas. Consider what might happen if one individual generates an idea and then a wide range of individuals develop that idea further into its final form. If the final idea is significantly different from the initial idea, how should the individuals be rewarded? Should the idea originator receive the greatest reward, even though the idea evolved significantly after its origination? If the individuals who assisted in developing the idea further are to receive rewards, how should the reward be parceled out? Managers must

consider these concerns carefully. For *Collective Innovation* to succeed, individuals must trust that their organization will implement fair rewards and recognition policies. Along these lines, managers should consider how a grassroots approach to incentives, such as the power of peer recognition and peer voting, might carry greater weight with individuals than traditional, top-down incentive strategies. As Malone writes, "...in all the places were qualities like motivation, flexibility, and creativity are important to a business – and that's a lot of places – decentralization will become increasingly desirable in the coming decades."[26]

Incentives often seem like the easiest lever for organizations to adjust when it comes to the alignment of organizational resources, processes, and values with the overall goals of the organization. Indeed, organizations have a wide range of incentives at their disposal and if adjusted strategically, can help align employee activity with organizational objectives. In articles such as *What's Wrong With Pay for Performance* and *Six Dangerous Myths About Pay*, however, Jeffrey Pfeffer lucidly outlines just how often managers pull financial incentive levers to compel employees to accomplish specific goals and just how often those efforts backfire.[27] Incentives are very powerful but can be quite dangerous if management does not treat them with great care and understand where and when incentive decisions may result in conflict.

Strategic Fit

Within the Strategic Design lens, strategic fit is a measure of just how well an organization's strategic design fits with market conditions. In numerous industries, the past several decades have seen a tremendous commitment to optimization and efficiency through processes such as "Six Sigma" and lean manufacturing. With such a strong commitment to exploitation and improvements in exploitation, organizations are finding it increasingly difficult to 'explore'. While innovation may have created the foundation upon which the organization was built, a deep commitment to the removal of variables, flexibility, and creative can result in the inability to innovate.

As in the case of P&G, it is becoming increasingly important for organizations to recognize the power of knowledge within their walls and outside of their walls. In a world where information can be easily and cheaply harvested, organized, and leveraged, a strategy of *Collective Innovation* can help organizations innovate successfully, repeatedly. Indeed, a strategy of *Collective Innovation* should help organizations improve how well their strategic design fits with the market conditions they face presently and will face in the future. Given the decreasing cost of communication and increasing availability of connectedness, an exploration approach designed around *Collective Innovation* should receive high marks for strategic fit.

Political Lens

> It's time to end the myth of the complete leader: the flawless person at the top who's got it all figured out. In fact, the sooner leaders stop trying to be all things to all people, the better off their organizations will be. In today's world, the executive's job is no longer to command and control but to cultivate and coordinate the actions of others at all levels of the organization. Only when leaders come to see themselves as incomplete–as having both strengths and weaknesses –will they be able to make up for their missing skills by relying on others.[28]

Through the political lens, organizations are viewed as social systems complete with a wide variety of both symbiotic and conflicting interests. The political lens focuses upon power and influence and reveals the struggles within an organization as entities compete for resources. Within an organization, power and influence are always fluctuating in level and location. The political lens views individuals within an organization as stakeholders and views the leader of the organization as responsible for building coalitions, managing interests, and working through conflicts. Finally, when examined through the political lens, change is driven by shifts in coalitions and the power of stakeholders within organization while entrenched bases of power are most often a barrier to that change.

Dangers of Management Interference

Throughout this thesis, we have identified the ways in which the power held by management can negatively impact the innovation process. Indeed, when an individual is promoted through the ranks of an organization, it is only natural that the individual begins to act in accordance with their increasing levels of responsibility. Traditional business school education, and indeed, conventional wisdom, teaches that individuals reach management level because they are uniquely qualified to make decisions and pass judgments. Often, managerial responsibility convinces individuals that they possess the necessary knowledge and experience to make decisions when in fact, the individuals may be ill-equipped to do so. This is one of the most central myths in management – that managers have all the answers.

There are numerous examples of how managers wielding power can negatively affect *Collective Innovation*. Consider an organization that decides to use an internal market to predict which ideas will be most valuable to the organization. The organization provides its employees with play money that the employees can allocate to stocks in the market with each stock tied to a specific idea. Employees invest their money in the ideas they find most promising and, through the power of the collective, specific stocks begin to rise to the top such that all the ideas in the market are rank ordered. Now, consider what happens if the market produces a top stock, but management disagrees with the market's choice. How does a manager explain that he alone is right while the market and indeed, the collective, are wrong? *Collective Innovation* requires that management be comfortable with managing the process of innovation while allowing the collective to make decisions. This notion is truly radical in the world of management – that the wisdom of employees, if harnessed carefully, should be used to guide organizational decision-making and strategic planning. Indeed, a traditional approach to management can quickly destroy *Collective Innovation*.

Now, a slight twist on the aforementioned scenario - consider an organization that carefully constructs a strategy of *Collective Innovation* through the use of an internal market and incentives to get employees to invest time and energy in that market. Consider what might happen if the collective identifies top ideas, but management chooses instead to fund the ideas that management alone finds promising or worse, the CEO's pet project. Indeed, the dominant approach to management is one in which management reserves 'decision rights' or 'delegated rights', the ability to ultimately shape the organization through their own decisions. If the organization was successful at convincing its employees that their views and knowledge are of value, such a dynamic may result in the rapid destruction of employee faith and trust in management.

Management's Decision and the Why?

The traditional responsibilities for senior management in most organizations, even those which claim to be flat, include setting the strategic direction. Their responsibility is to create a set priority projects for the company, while accounting for the competitive and product landscape, internal capabilities, consumer needs, and then to allocate the funds and resources appropriate to execute those projects in a timely fashion. In short, senior management seeks to create a logical case supporting the selection of specific projects as well as answering the question of why the company is moving in a strategic direction.

The *Collective Innovation* process turns this formula around. When management has a rank-ordered list of idea initiatives as determined by the collective knowledge of its employees and other stakeholders, the question that management must now answer is "Why not?" If a list of initiatives represents the well-informed recommendations set forth by the collective, management now finds itself in the position of either accepting those recommendations or making an argument for why it will not go along with the initiatives recommended.

Of course, all companies face capital constraints. However, the implicit assumption in the *Collective Innovation* process is that management will accept the direction set forth by its employees and proceed, unless there is a compelling reason to do otherwise (in theory, the previous stages within the *Collective Innovation* process should have already accounted for most objections or hurdles).

Some managers may feel marginalized in an environment that harvests the collective knowledge to answer questions which previously lay at the heart of their job. Many managers will not know how to occupy their time when the bulk of their responsibility is removed. Some managers reject the system and fight for their position, arguing that the collective decision does not account for a variety of factors of which they alone are aware. This is a legitimate argument but one which could be countered as a result of poor information dissemination. One simple solution is for the manager to participate more fully in the process by contributing that information to inform the group of the influential data points. Unless the manager accepts the new order, the alternative is to reject the system and leave.

The Importance of Relational Contracts

The changing dynamic of management responsibilities extends to the 'relational contract' that exists between management and employees. In the traditional innovation process, managers limit the participation of employees in the analysis and selection of strategic initiatives and the expectations of each party toward the other are simple. In the *Collective Innovation* process, managers send specific signals and establish expectations by engaging employees in the process.

By requesting that employees devote some of their precious time at work to evaluate the strategic opportunities for the organization, management provides its employees with significant responsibility, the consequences of which are dire if failure is the outcome. Indeed, this is the

organization's strategic direction towards which millions of dollars will be invested and hundreds of thousands of person hours devoted. Investors will be hold management responsible and will respond accordingly by selling off stock if earnings and other performance objectives are not met. The expectations of management on employees to participate and not game the system are thus extremely high.

The same holds true for the converse. Employees have expectations of management. If senior leadership values the collective opinion of its workers, then management is expected to listen and heed this advice. If management reserves the right to selectively use the information gathered, then it undermines the relationship with its employees. By not using the information from the collective, management devalues the employees' opinion, eliminates trust and eradicates the incentive for employees to participate in the future. The message sent by not heeding the advice of the collective is that their opinion really does not matter.

Successful *Collective Innovation* requires that organizations adopt management philosophies that many would consider radical. Organizations much recognize the power of the collective to make, on average, decisions more accurate than experts. Organizations must also accept that technology is now redefining what effective management and leadership is in the 21st century and that the placement of power in the hands of the collective can be more effective than in the hands of a few individuals. To be successful, however, such an approach requires management support. One of the most powerful accelerators of a *Collective Innovation* strategy is strong, visible support by senior executives within an organization while a lack of support from senior leadership is one of the quickest ways to defeat it.

Cultural Lens

Through the cultural lens, organizations are viewed as institutions and as systems of meaning, values, artifacts, and routines. A cultural lens analysis focuses upon norms and traditions and the influence that they have on individual behavior within the organization. Within an organization, a cultural lens analysis suggests that habit drives action. An organization's culture is shaped by meaning and interpretation. The cultural lens views the leader of the organization as responsible for establishing a vision while helping to set and manage a dominant culture. When examined through the cultural lens, change is driven by challenges to basic organizational assumptions, an influx of new values, and conflicting interpretation of values. The strength of the dominant culture is frequently the most powerful barrier to any culture shift.

While organizations often fall back on incentives to shape individual conduct, incentives are essentially a 'blunt instrument' when compared with the subtle, multifaceted power of organizational culture. An organization's culture sets expectations for individual behavior, commitment, time management, interaction, and task prioritization. An organization's culture can shape individual conduct through a natural process of voluntary assimilation. Organizational culture also forms a 'mold' into which only specific types of individuals will fit. Those individuals that find the norms and characteristics of a particular culture desirable will often flourish within while individuals who clash with the culture are often better served to seek involvement elsewhere.

Power of Dominant Culture

The dominant culture of an organization influences whether or not an organization's attempts to innovate are going to be successful. Since a strategy of *Collective Innovation* places a particular emphasis on the use of individuals within organizations to drive innovation, the organizational culture plays an important role. Compare an organization that chastises failure

with an organization that views failure as a necessary step towards success. Compare an organization whose management reserves the right to make final decisions with an organization whose management supports the decisions of the collective. Compare an organization who views its employees as the components of a machine with an organization who views its employees as members of a community or a family. Compare an organization that does not reward its employees for 'going the extra mile' with one that offers such rewards. Innovation flourishes when an organization creates a fun, safe, flexible, supportive environment for exploration. Given that such characteristics are often not conducive to exploitation, it may be necessary in fact to separate organizational exploitation from exploration.

Consider a scenario in which an entry-level employee thinks up an innovative idea. If the organizational culture is one that rejects risk, condemns failure, and does not reward extra effort, the employee may be tempted to leave the company. If the organizational culture is one that embraces risk, acknowledges failure as a 'cost of innovating', and rewards unique contributions, the employee is more likely to bring her ideas to management.

On January 31, 2005, Google announced that it had created the 'Founders' Award', an award of restricted stock often worth millions or tens of millions of dollars that would be given to employees or teams of employees who generated significant business value for the Company through new projects.[29] Since employees might be tempted to take significant ideas outside the company to cash-in on a potential IPO, Google's founders wanted to create a similar financial incentive for those employees to remain within Google. Given that those employees could take advantage of Google's resources in endeavoring to make their idea successful, a rational calculation by those employees of the pros and cons of internal and external entrepreneurship should end up in Google's favor. Various online reports suggest that the developers responsible for Google's VoIP and text chat application, Google Talk, received a Founders' Award during

the summer of 2006 and that at least one other team within the Company has received such an award.[30]

Importance of Shaping Dominant Culture

The 'Founders' Award' is just a small piece of the carefully constructed puzzle that is the Google dominant culture. Google has gone to great lengths to show its employees that it cares about them, their well-being, and their ideas. Google's offices have game rooms, stocked with video games, pool tables, and other amusements for employees to play while taking a break.[31] All food is gourmet and free at Google's famously lavish cafeterias. Google provides snack rooms as well, stocked with all kinds of healthy and not-so-healthy snack items for in-between meals. There are private spaces for private phone calls and complete showering and changing facilities for employees who travel to work by foot or bike. There are free, Wi-Fi-enabled shuttle buses and free car washes and oil changes onsite at Google's Mountain View, California headquarters. The headquarters also includes free hair salons, gyms, personal concierge, laundry facilities, doctors, child care, and motorized scooters for transportation.[32] Dry-erase boards for brainstorming lie scattered throughout Google's buildings. These perks and considerations, among others, helped make Google *Fortune Magazine's* top company to work for in 2007.[33]

Naturally, this extensive list of benefits and amenities would have little value if Google then proceeded to ignore the ideas of its employees and impose a heavyweight management structure. Indeed, while Google does struggle with 'managers needing to manage', employee ideas are highly valued and grassroots support for an idea are said to trump management bottlenecks. Google also encourages employee risk-taking and recognizes that with such risk-taking, mistakes are unavoidable:

> Take the case of Sheryl Sandberg, a 37-year-old vice president whose fiefdom includes the company's automated advertising system. Sandberg recently committed an error that cost Google several million dollars -- "Bad decision, moved too quickly, no controls in place, wasted some money," is all she'll say about it -- and when she realized the magnitude of her mistake, she walked across the street to inform Larry Page, Google's co-founder and unofficial thought leader. "God, I feel really bad about this," Sandberg told Page, who accepted her apology. But as she turned to leave, Page said something that surprised her. "I'm so glad you made this mistake," he said. "Because I want to run a company where we are moving too quickly and doing too much, not being too cautious and doing too little. If we don't have any of these mistakes, we're just not taking enough risk."[34]

Given all its resources, Google is an example of how an organization can shape its dominant culture such that employees desire to work hard to support the organization's goals. *Collective Innovation* thrives when management generally creates a culture that values employees, protects employees, and makes a concerted effort to promote employee well-being.

Execution

Collective Innovation will fail if an organization understands the theoretical underpinnings of the strategy and puts the tools in place, but neglects the organizational foundation. Organizations, at their core, are made up of individuals. Each individual possesses a unique set of knowledge, experience, abilities, strengths, weaknesses, goals, hopes, and fears. *Collective Innovation* seeks to aggregate the power of individual knowledge into a force that can power successful, repeated organizational innovation. *Collective Innovation* requires that organizational management is attuned to organizational idiosyncrasies when viewed through both the RPV and Three Lenses frameworks. *Collective Innovation* will only be successful if management adjusts the appropriate strategic, political, and cultural levers at its disposal to build the necessary levels of employee trust, care, commitment, and loyalty.

Through our research, we have identified four different organizational scenarios in which *Collective Innovation* can function. These four scenarios address the different constraints that organizations may face based upon their size, age, and need for innovation. The next chapter presents these scenarios.

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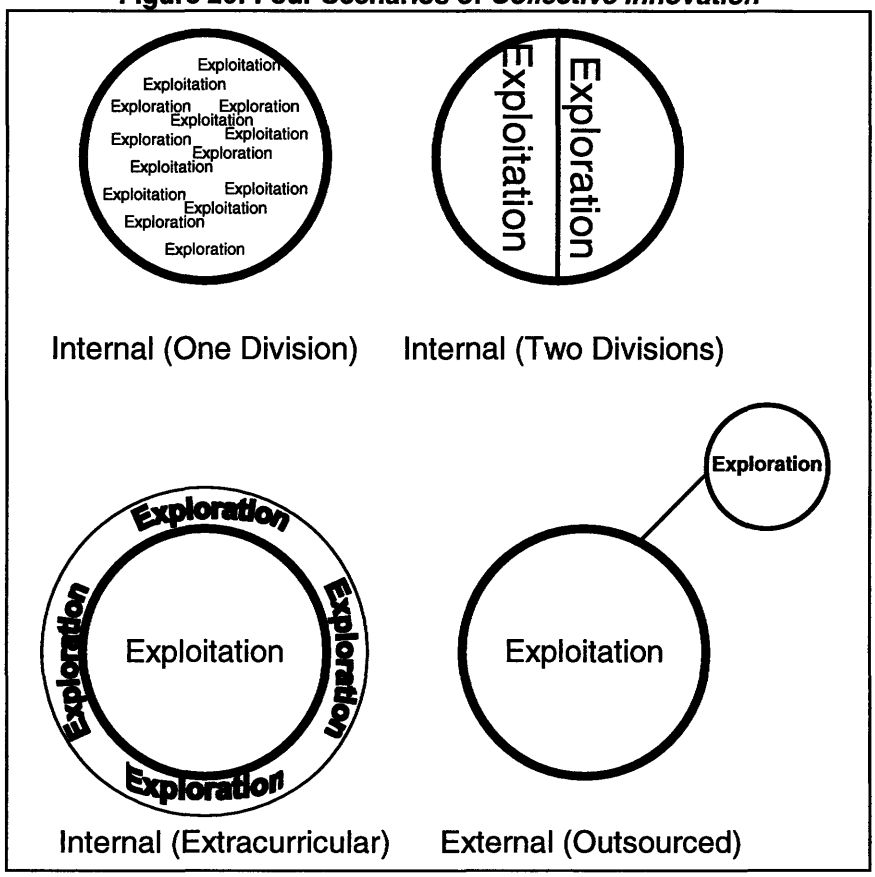
Chapter Eight: Implementing Collective Innovation

In this chapter, we present four strategies through which organizations can implement *Collective Innovation* (See Figure 20): Internal (One Division), Internal (Two Divisions), Internal (Extracurricular), and External (Outsourced). Each of the strategies has its strengths and weaknesses depending upon the size of the organization, maturity of the organization, and an analysis of the organization through both the *RPV* and *Three Lenses* frameworks introduced in the previous chapter. Just as there is no single organizational design, there is no single correct strategy for implementing *Collective Innovation*. We argue, however, that there are four approaches available to firms who must choose one or create a hybrid of multiple depending upon managerial preferences.

Figure 20: Four Scenarios of *Collective Innovation*



Internal (One Division)

Overview

This *Collective Innovation* scenario features an organization whose employees divide their work weeks between exploitation and exploration. Such an organization does not have a unique research and development division and instead managers ask employees to bring existing products and services to market while also devoting time to the identification of future products and services. This scenario is one that can be implemented by an organization of any size or any stage of maturity.

Consider Google's policy of letting its software developers commit 20% of their work week to personal projects. The Internal (One Division) scenario begins with such a policy but extends it further by eschewing the creation of an R&D division and instead, setting both exploitation and exploration tasks that employees must accomplish each week. Similar to a consulting firm, where employees may divide their time between two distinct consulting engagements at the same time, such an organization would have its employees divide their time between those tasks. For example, employees might have weekly targets to meet for both tasks. A particular employee might be expected to spend, say, the majority of their time filling customer orders in a given week while also finding time to review and develop new ideas in the exploration database.

For this scenario to be successful, the organization must consider how to mitigate the inherent conflict between the processes and values that drive exploitation and those that drive exploration. The organization must group its employees primarily for exploitation while creating informal groups and linking mechanisms for the communication and collaboration necessary to drive exploration. Management must carefully construct a reward and recognition strategy that underscores the importance of both processes to the organization. In particular, the organization

must use incentives to shape the dominant culture such that managers make exploitation decisions where appropriate while facilitating and encouraging, but not obstructing, exploration processes.

Opportunities

The Internal (One Division) scenario has a number of strengths. Given that employees are engaged in both exploitation and exploration, they can leverage their knowledge of organizational exploitation processes to help generate both incremental and disruptive innovations. Since employees would be expected to engage in both processes, management can take full advantage of strategic, political, and culture levers to help shape employee activity to suit overall organizational goals. This scenario does not require a duplication of organizational structures and is efficient when it comes to the implementation of new ideas, given that the same employees are involved in both processes. Finally, this scenario also avoids some of the cultural challenges that exist when distinct sets of employees are dedicated to each process.

Challenges

Given the remarks in the previous chapter, it should come as no surprise that this scenario maybe hard to implement successfully. At the basic level, the organization must ask its employees to engage in two processes whose goals and requirements conflict. Furthermore, since exploitation keeps an organization in business, most organizations would find it extremely difficult to keep exploitation tasks from impinging upon employee time to explore – consider Google's challenge in ensuring that its employees have 20% of their time each week to devote to exploration when the employees of those managers have exploitation goals to achieve. Finally, while it may be possible in theory to compel management to take different approaches to how they organize and shape employee activity in both processes, in practice, it is difficult.

Internal (Two Divisions)

Overview

This *Collective Innovation* scenario is the most common scenario in business today. The Internal (Two Division) organization features a section or division of the organization dedicated to exploitation tasks and a section or division devoted to exploration. In most organizations, the majority of organizational employees are dedicated to exploitation tasks while a small, unique division, say a research and development (R&D) division, exists for exploration. In other cases, an organization might equally split its resources between exploitation and exploration with two equally-sized and supported divisions. The allocation of resources and respective sizes of these divisions follows the demands of the organization's industry and market conditions - in some industries, competitive advantage will come from a particular emphasis on process improvement and exploitation while in others, new products and exploration drive competitive advantage. Most large product and service companies pursue an Internal (Two Division) scenario in some way. This scenario is one that can be implemented by an organization of any size or any stage of maturity.

The application of *Collective Innovation* in an Internal (Two Division) scenario is straightforward. The division charged with exploration takes responsibility for driving the four stages of *Collective Innovation*. If organizational leadership is able to carefully design the necessary reward and recognition strategy, the exploration division can then open up its tools to the other employees within the organization. If the appropriate intellectual property protections are in place and the organization is careful about the content it discloses, the exploration division can also open up its tools to the entities within the organizational context (partners, suppliers, customers) and beyond.

Opportunities

The Internal (Two Divisions) scenario has a number of unique strengths. First, this scenario avoids many of the RPV challenges that can derail the Internal (One Division) scenario. Similar to the strategy that Christensen and others recommend for handling discontinuous innovation, the Internal (Two Divisions) scenario allows both exploitation and exploration to occur without the distinct sets of processes and values for each coming into conflict. Since both divisions have unique goals, organizational exploitation and exploration can advance in parallel. Depending on the extent to which both divisions are physically separated, organizational management may be able to infuse each division with an optimal strategic design, political structure, and dominant culture to achieve the goal of the division.

Challenges

When two divisions are allowed to develop strong, yet distinct processes and values, there is a danger of disconnection. Specifically, Stage Four in the *Collective Innovation* process requires the transition of innovative ideas into business practices. If an organization is able to generate a wide range of innovative ideas, but cannot either generate or capture value from those ideas, the value of *Collective Innovation* is negligible at best. As a result, an organization must be able to create links between its exploitation and exploration efforts when ideas are ready for execution. In the Internal (Two Divisions) scenario, rivalry can develop between the two divisions such that walls form and communication and knowledge-sharing pathways are cut off to the determinant of the firm as a whole. In addition, the economic costs of maintaining two separate divisions, particularly if they both demand their own functional hierarchy, can be quite high. Medtronic, the world's largest medical device's company, is an excellent example of an organization that began by pursuing an Internal (One Division) model and now utilizes an Internal (Two Division) model (See Appendix C).

Internal (Extracurricular)

Overview

This *Collective Innovation* scenario is unique with heavy reliance on the power of carefully developed rewards, recognition, and culture. The Internal (Extracurricular) strategy commits normal organizational operating hours to exploitation while shifting organizational exploration processes to nights and weekends. This approach may seem radical because it uses the 'downtime' that employees have when they are not at work. Although some employees may find their 'extracurricular' time filled with familial responsibilities, other employees, particularly software developers, may work on their own projects or engage in personal hobbies. The Internal (Extracurricular) scenario theorizes that employees, if given the option of engaging in fun exploratory projects, games, and tasks for the company, will devote personal time to such exploration, particularly if it promises advancement and both intrinsic and extrinsic rewards.

Consider the amount of time that employees invest in playing "Fantasy Sports." With the commencement of each sporting season in the United States, millions of Americans flock to websites where they can build simulated teams of athletes, decide which athletes to make active each week, and then earn points based upon how well those athletes perform in real life. According to a research report published in late 2006, more than 17 million individuals around the world were expected to have played fantasy sports during 2006.[1] According to a press release by the Gale Group, a market research firm, the fantasy sports industry has grown by as much as 10% each year since 2003.[2]

Individuals play fantasy sports for a variety of reasons. Given that players most often are required to commit entrance fees to join a particular league, substantial monetary rewards, depending upon the size of the league, await those individuals whose teams outperform all others. Fantasy sports leagues often include powerful chat, blog, and forum features, creating a

community irresistible to sports lovers desiring to find others just like them. Fantasy sports drive water-cooler conversation around the workplace as individuals often play with their co-workers and other friends. Peer recognition is also a powerful motivating force.

As can be expected, fantasy sports participation not only occurs outside of the workplace. According to a variety of surveys, millions of individuals devote several hours per week to fantasy sports and it is estimated that at least some of that involvement takes place during office hours. As a research report stated, "...the impact on employers is significant. At the more conservative level, [the research firm estimated] that the cost to employers in unproductive wages [would] top $500,000,000 per week or roughly $8.5 billion over the entire [2006-2007] 17-week regular NFL season."[3]

Now, keeping in mind the time commitment to fantasy sports, along with the time that some employees devote to personal hobbies related to work outside of work hours, what might happen if an organization could create a 'fantasy company' simulation? What if an organization created a database of employee-contributed ideas and employees would receive rewards and recognition for reviewing the ideas, contributing to the ideas, and volunteering their time to work on the ideas? What if employees could participate in markets or games that leveraged their knowledge to benefit organizational exploration while being fun, creative, and rewarding? While most employees would not consider devoting time outside of normal office hours to their work, they may be swayed by a careful strategy of rewards, recognition, and culture. What might happen if the organizational culture was such that this kind of effort or 'community service' was expected? What if the potential intrinsic and extrinsic rewards were great enough, such that the company would ultimately come out ahead, but that the employees would be willing to participate? Finally, the Internal (Extracurricular) scenario posits that the top ideas developed

through extracurricular exploration processes should eventually be imported into the organization's exploitation processes when deemed ready by the collective.

Opportunities

The Internal (Extracurricular) scenario offers a unique approach to the challenges of exploitation and exploration. The exploration activities themselves have the potential to build a strong sense of community and camaraderie within the organization and to excite and energize employees. Through simulations and games with real rewards and recognition attached, employees can engage in friendly competition and build strong informal social networks. Such activities also enable the organization to benefit from employees using their knowledge of organizational capabilities as they contribute, develop, and execute new ideas. If appropriate, this scenario can also create exploration activities to harness the knowledge and perspective of suppliers, customers, and partners in such tools.

Challenges

Given the possible advantages of this scenario, it is only natural that it will be very challenging to implement successfully. It is a radical notion to consider employees caring enough about their organizations to devote time outside of the workplace to work. To implement this scenario, an organization would have to conduct detailed *RPV* and *Three Lenses* analyses before constructing a slow, careful, staged implementation. In most organizations, existing processes and values, including lack of employee care for the organization beyond basic employment, will simply create too much inertia against the change necessary for this scenario to work. Indeed, this scenario may only be possible if it is implemented from the first day the organization exists.

External (Outsourced)

Overview

This *Collective Innovation* scenario allows organizations to focus on their core exploitation competency while outsourcing exploration to small organizations built for that

purpose. Given the numerous challenges that organizations face when trying to exploit and explore simultaneously, a firm successful at exploitation may recognize that another organization is in a better position to drive exploration. This scenario is also one that can be implemented by an organization of any size or any stage of maturity.

Consider applied sciences or life sciences companies facing roadblocks in their attempt to develop a new product. Since July 2001,a growing number of these companies have turned to InnoCentive, a spinout of pharmaceutical company Eli Lilly and Company, to surmount these roadblocks.[4] Based in Andover, MA, InnoCentive has a carefully designed process for connecting up companies with scientific problems, or 'seekers', with individuals who might be able to solve those particular problems, or 'solvers'. First, the seeker identifies the problem they need solved and then works with InnoCentive to determine whether or not the problem is appropriate for posting on the InnoCentive website. Next, the seeker, along with InnoCentive, develops a problem statement, including a timeline for solving the problem, the criteria that the solution must meet, and the ultimate monetary reward for solving the problem. After the problem statement has passed through several review processes, the problem is then posted on and publicized through the InnoCentive website.

Solvers are individuals with the skill sets and interest levels to tackle problems posted on the InnoCentive website. As solvers identify problems in which they may be interested, InnoCentive puts them through a multi-stage verification process to ensure the seriousness of their commitment and the applicability of their experience and skill set. As the solver progresses through each stage, he or she is given increasingly granular access to the problem and the contextual information that they might need to solve the problem. Once the verification process is complete, the solver, either individually or in a team of solvers, begins to work on the problem. If the solver identifies a possible solution to the problem, the solver submits it to InnoCentive

whose scientific experts evaluate the solution. If the solution is deemed to require additional work, InnoCentive engages the solver in a dialogue as the solver improves the solution to a point at which InnoCentive finds it acceptable. As solutions are deemed acceptable, InnoCentive passes them along to the seeker and, if the seeker deems the solution appropriate, works with both the seeker and solver to transfer intellectual property ownership as well as to award prize money to the solver.

While the InnoCentive model seeks to help organizations find answers to scientific problems, the BIG Idea Group in Manchester, NH seeks to help organizations improve existing products and processes as well as generate ideas for new products and processes (See Appendix A). A related example is Cambrian House (See Appendix B). Cambrian House has created a process through which developers submit ideas for new software applications, those ideas are developed, ranked, and market tested, and top ideas are allocated venture funds and functional supports to transition from ideas to actual applications. Yet2.com, on the other hand, allows organizations to post intellectual property that they would like to license online and then helps other organizations find intellectual property that meets their particular needs.

Opportunities

As public awareness of these 'innovation exchanges' and 'crowd sourcing' approaches grows, a growing number of large, established organizations are turning towards small explorers to help them solve problems or find new growth opportunities. The External (Outsourced) scenario provides established organizations with a flexible menu of exploration possibilities. An organization could choose to outsource the first stage of its *Collective Innovation* process, for example, and use an outside firm purely for the generation of new ideas that the organization than develops, prioritizes, and executes internally. Alternatively, an organization could use an outside firm for a few or all of stages of *Collective Innovation*, slotting ideas into its own processes when fully developed, vetted, and ready to be launched.

Although the challenge of integrating new ideas into existing processes remains, the External (Outsourced) scenario addresses the resources, processes, and values challenges that face exploitation and exploration. The main organization is able to focus specifically on core exploitation tasks while leveraging another firm to deliver exploration more successfully and more efficiently than the main organization. Given that the External (Outsourced) scenario takes advantage of an objective third-party firm, the potential also exists for the generation of a much wide range of ideas than the main organization could develop on its own. Finally, a third-party organization can develop a purpose-built set of exploration processes and values that it can monetize across a wide range of engagements while a single organization attempting to build its own third-party organization in-house would most likely find it economically infeasible.

Challenges

Despite a wide range of advantages, the External (Outsourced) scenario does have its challenges. The outsourcing organization must be comfortable with giving up a degree of ownership over the exploration process and must recognize that the output of the process itself may conflict with existing organizational processes and values. In addition, if organizational management continues to insist upon making final decisions, rather than accepting, or at least working with the output from the third-party, exploration can still ultimately fail. Along this line, the outsourcing organization must consider carefully how to remove any internal barriers to the acceptance and execution of ideas that exit the process. Finally, in order for the scenario to work, intellectual property must be disclosed to the third-party firm and depending upon that firm's processes, to additional individuals as well. As a result, the primary organization must protect its intellectual property carefully and ensure that the necessary agreements are in place.

Execution

If executed carefully, the *Collective Innovation* process has the power to help organizations avoid some of the strongest barriers to repeated, successful innovation. As discussed in Chapter Seven, however, the careful execution of *Collective Innovation* is far from easy, particularly given the idiosyncrasies inherent when hundreds or thousands of human beings are brought together to accomplish tasks. Indeed, a process that seems fairly straightforward can face a wide range of challenges when executed and each challenge has the power to derail the entire strategy.

This chapter presented four different scenarios through which *Collective Innovation* may be implemented. There is, of course, no 'silver bullet' or one 'right' scenario. Through careful *RPV* and *Three Lenses* analyses, an organization can determine which scenario is most appropriate. It is essential that organizations involve employee representatives when analyzing and selecting the appropriate scenario. For some organizations, it may be most appropriate to pursue a hybrid solution. Consider an organization choosing to create an internal R&D division while also leveraging the services of a third-party firm as a supplement. If an organization successfully selects the correct scenario to implement, it may also enjoy valuable cultural and motivational benefits that it did not anticipate. Finally, once an organization selects a particular scenario or hybrid and then implements the solution, the task is not complete. *Collective Innovation*, insofar as it relies upon the power of individuals, must be managed carefully with any misstep having the potential to destroy the progress made.

The next chapter, the final chapter of this thesis, takes a step back and reviews the theoretical underpinnings of *Collective Innovation*, the potential value of *Collective Innovation*, and the reality of its execution.

[1] http://mithras.itworld.com/download/book_chapters_and_wps/challengergray/060801_fantasyfootball.pdf (Accessed 12:07pm, 4/4/07)

[2] *Fantasy sports players are a unique breed of fan.* Gale Group Research Alert, September 1, 2006

[3] http://mithras.itworld.com/download/book_chapters_and_wps/challengergray/060801_fantasyfootball.pdf (Accessed 7:27pm, 4/8/07)

[4] Huston, Larry, and Nabil Sakkab. "CONNECT AND DEVELOP. (Cover Story)." Harvard business review 84 (2006): 58-66.

Chapter Nine: Conclusion

'The Connected Enterprise'

There are few who will question the success of the interactive, user-created Internet or what is termed as 'Web 2.0.' From Flickr and Facebook to Wikipedia and YouTube to del.icio.us and digg, there are numerous examples of sites whose success is a grassroots phenomenon of user interest, in contrast to the 'top-down', organizationally-generated content of 'Web 1.0.' Communities and connectedness lie at the heart of this success. The highest-performing Web 2.0 sites successfully bring together individuals from around the world not only to create and share content, but to meet each other and build personal connections based upon commonalities. When individuals begin to invest time, effort, and emotional energy in a website, that website is well on its way to engendering the type of loyalty and commitment necessary for success in an online world.

In the Spring 2007 issue of the MIT Sloan Management Review, Harvard Business School Professor Andrew McAfee authored an article entitled, *Enterprise 2.0: The Dawn of Emergent Collaboration*. Through his research, McAfee explains how organizations are beginning to take advantage of some of the Web 2.0 tools and technologies, such as personalized searching, linking, blogging, tagging, extending, and signaling - these that have already proven popular in the personal and public world. In the article, McAfee coins the term 'Enterprise 2.0' to represent this movement, defining the term specifically as a category of "platforms that companies can buy or build in order to make visible the practices and outputs of their knowledge workers."[1]

In March 2007, IBM announced the development of several tools designed to bring a new level of connectedness, collaboration, and interactivity to the organization. One of the tools, Lotus Connections, is designed to bring the power of several different Web 2.0 tools,

traditionally only used by consumers, to the enterprise world.[2] Lotus Connections includes five key components: Profiles, Communities, Blogs, Dogear, and Activities. The 'Profiles' component allows employees to post personal profiles, including name, photo, place in the organizational hierarchy, location, and personal description of areas of expertise and areas of interest, for the rest of the organization to view. The 'Communities' component provides a wiki-like environment for individuals to gather and collaborate through text, bookmarks, and task lists, be those individuals part of a formal team or simply sharing interests or hobbies. The 'Blogs' component enables individuals to post their own online journals. The 'Dogear' component allows individuals to use tags and bookmarks to note websites and other resources of interest for both personal use and to be searched and accessed by others in the organization. Finally, the 'Activities' component enables individuals and teams to build rich, collaborative task lists and schedules.

It is clear that enterprises are now beginning to take clues from the world of consumer Web 2.0. Rather than dismiss the success of Web 2.0 as a 'not ready for prime time' phenomenon, organizations are beginning to see that Web 2.0 tools, technologies, and philosophies may have a comfortable home within their walls. Indeed, if an organization could use the tools and technologies of Web 2.0 to generate even a fraction of the loyalty and commitment that such tools presently generate from their employees outside the workplace, the entire concept of 'work' may be redefined.

At its core, *Collective Innovation* is designed to harvest the knowledge, experience, and creativity of the individuals internal and external to an organization. Beyond simply suggesting a new level of 'openness', *Collective Innovation* seeks to connect individuals together to solve collaboratively the problems of organizational innovation. Through the tools and technologies of Web 2.0, a carefully designed *Collective Innovation* strategy gives each individual in the organization a voice. By implementing a strategy of *Collective Innovation*, management

demonstrates that it cares about its employees, values their perspective, and that each individual is a treasured, unique resource. By creating a community for exploration, *Collective Innovation* attacks the challenges of successful, repeated innovation in a novel way.

This thesis began by building a foundation for *Collective Innovation* from a diverse array of materials. In the Preface, we built a case for the decentralization of the organizational innovation process. By integrating the work of Adam Smith, Ronald Coase, and Thomas Malone, the 'Preface' explains specifically why now is the time for organizations to take a collective approach to innovation. Chapter One then introduced the concept of collective intelligence as well as the value of innovation to organizational competitive advantage. Through discussions of collective intelligence, openness, and organizational innovation, Chapter Two established the theoretical underpinnings for *Collective Innovation* and set the concept itself in the context of the history of organizational innovation. Chapter Three completed the foundation by examining the specific challenges of organizational innovation and the logic supporting *Collective Innovation* as an ideal solution.

The core of the thesis presented the *Collective Innovation* process itself. Chapter Four examined the first stage, Idea Creation, and articulated how collective intelligence can be used to generate innovative ideas. The second stage, Idea Development, was the subject of Chapter Five and explained how the power of collective intelligence can revolutionize how new ideas are developed and vetted. Chapter Six addressed the third and fourth stages, Idea Prioritization and Idea Capitalization, describing the use of collective intelligence to first prioritize the ideas that emerge from the stage two and then to allocate resources to those ideas.

The last two chapters of the thesis prior to this conclusion focused upon the application of *Collective Innovation*. Chapter Eight addresses the complex puzzle of the organizational

foundation and how it can both accelerate and inhibit the implementation of *Collective Innovation*. Given the delicate organizational dynamics discussed in Chapter Eight, Chapter Nine laid out four real-world scenarios by which an organization might execute a strategy of *Collective Innovation*.

A Challenging Reality

In this thesis, we have attempted to treat comprehensively the challenges of innovation and the complexities of organizations that must be considered if *Collective Innovation* is to be implemented successfully. Despite this effort, there remain a number of problems that we summarize here.

The Reality of Disruption

Discontinuous Innovation requires that organizations act in a way that they simply cannot, given constraints of processes, values, and business models. Countless books have been written about the signs of impending disruption and how organizations might successfully survive disruption. Even considering the widespread academic research and media attention to the topic, however, organizations both large and small continue to disrupt and be disrupted. Although *Collective Innovation* seeks to involve employees more deeply in the innovation process and, thus, lessen the resistance of change, in most cases, the inertia of organizations may simply be too strong to fight. Simply put, change is scary, and even if recognized in advance, few individuals are willing to consciously take the steps that will result in the loss of their own job, however necessary those steps might be to preserve the future of the organization.

The Reality of Economics

The economic model of *Collective Innovation* must also be tested. We hypothesize that the time and resources an organization must spend on the tools, technologies, and foundation to support *Collective Innovation* will deliver an attractive return-on-investment as the

organization invests in fewer false positives (e.g. ideas that organizational leaderships sees as valuable yet end up consuming significant resources and resulting in little or no value creation and/or capture at best) and also recognizes potentially disruptive ideas more quickly. But only trial and error will bear this out. As discussed in Chapter Eight, the successful use of intrinsic and extrinsic motivators is challenging, particularly when attempting to involve individuals outside of the organization in the *Collective Innovation* process.

The Reality of Performance

Although the decentralization of innovation and harnessing of collective intelligence to aid organizational exploration hold significant promise, overall performance and 'speed to market' is at stake. As introduced in the Preface, organizations form in large part to reduce the transaction costs inherent in markets. If ideally constituted, however, markets will always be the optimal organization form to exchange goods and services. The decreasing cost of technology is now reducing market transaction costs and making the 'marketization' of organizations increasingly possible and appropriate. Decision-making, however, is a process frequently slower and more unwieldy when made by the many, rather than the few, and by the distributed and decentralized, rather than the concentrated and collocated. Thus it is possible that *Collective Innovation* maybe substantially slower at moving ideas from conception to execution than other exploration strategies, even if the 'hit rate' is higher.

The Reality of Markets

While the accuracy of prediction markets appears to be the driving force behind private company adoption of the tool, the more lasting and potentially more compelling benefit may fall in the realm of organizational culture. Prediction markets and similar predictive tools in which employees and other individuals are involved create an implicit relational contract between them and senior management which can result in increased employee loyalty toward the firm.

When senior organizational management requests that their employees take part in a prediction market as a *Collective Innovation* exercise, it sends a distinct signal to employees that their voice, knowledge, and analysis are valuable to the organization.[3] The strength of the signal depends upon the exercise and the question it is attempting to answer. The more strategic or significant the question, the more management is perceived by employees as entrusting them with an important task - this is the unique relational dynamic which can strengthen employees' sense of ownership and commitment.

As mentioned, in ideal circumstances such as that of Rite-Solutions, management created a communal culture with the market as a central tool. In our interviews at the company, we observed employees who view the company as an extension of their social community and not merely as a place of work.

The Reality of Timing and Rhythm

It is important that organizations consider when and how frequently to use the *Collective Innovation* tools. The consensus among practitioners and researchers is to keep it simple, brief, and regularly scheduled. There is perhaps a tendency to become enamored with the potential of collective intelligence tools. The best practice derived from our discussions with executives at Hewlett Packard, InnoCentive, and Rite-Solutions among others is to keep the tool simple. Many employees and other participants may become confused and frustrated. This could lead to decreased participation.

Practically speaking, management does not want employees constantly occupied with the internal markets or overly burdened with time intensive surveys. Nor do employees want to be continuously distracted. Bernardo Huberman of Hewlett Packard, a leading researcher of collective intelligence tools for management applications, refers to these predicaments as "simple, human elements that management must heed during any implementation."[4]

The best approach it seems is to keep a regular schedule of dates when employees will be expected to participate. This establishes a cadence to innovation. Such a disciplined approach seemingly runs counter to the general culture surrounding the collective concepts of free flowing information, democratization of ideas, and decentralization of authority, but practitioners all advocate the regulation of time. There is much research supporting the importance of achieving a balance between freedom and discipline.[5] As Shapero emphasizes "...without deadlines, few creative projects would ever finish."[6] This may be true for many outside the creative circle, but uniquely applicable within it. Medical device company Medtronic is a strong example of how cadence can be used in practice (See Appendix C).

The Reality of Politics

As long as organizational leadership and management reserve 'decision rights', consciously or subconsciously, organizations will face challenges when attempting to innovate. *Collective Innovation* attempts to shift the traditional locus of power within organizational exploration processes from the top of the organization to the entire organization itself. The very notion of management relinquishing some power and control is radical and will assuredly face significant resistance in most organizations. In those organizations whose leadership is willing to think flexibility and differently about exploration, the explicit support of the *Collective Innovation* process by those leaders will be the strongest catalyst for its success. In organizations whose leadership prefers the traditional 'command and control' approach to management, *Collective Innovation* will most assuredly fail.

The Reality of Culture

As long as human beings set their own self-interest above the interests of others, organizations will face challenges when attempting to innovate. Much as a shift in political structure is critical to the success of *Collective Innovation*, so too is a shift in culture; in a departure from tradition for most organizations, *Collective Innovation* requires that employees

communicate in a common language of innovation, of experimentation, and of community. Given that the participation of the collective is central to our exploration strategy, many mature organizations may find the creation of a separate division through the Internal (Two Divisions) scenario or the External (Outsourcing) scenario to be the most appropriate approaches.

The Last Word

Much as every organization is unique, so to is the perfect innovation strategy – there is no 'one-size-fits-all' approach. No innovation strategy is completely closed, completely open, or completely collective. Every organization must pursue a strategy most compatible with its goals, its industry, and the organizational foundation on which such a strategy rests. If organizations recognize that the sum of individual knowledge can be greater than the knowledge held by any one individual, they will be substantially closer to achieving the goal of successful, repeated innovation.

[1] McAfee, Andrew P. *Enterprise 2.0: The Dawn of Emergent Collaboration* MIT Sloan Management Review; Spring2006, Vol. 47 Issue 3, p23.
[2] http://www-142.ibm.com/software/sw-lotus/products/product3.nsf/wdocs/connectionshome (Accessed 9:14am, 4/11/07)
[3] In fact, the collective voice could be construed as more valuable than that of the senior management as is the case with Rite-Solutions.
[4] Authors' interview with Dr. Bernardo Huberman, Senior HP Fellow and Director of the Information Dynamics Lab at Hewlett Packard Laboratories, on April 20, 2007
[5] Davila, T., Epstein, M., & Shelton, R. (2006). *Making Innovation Work.* City: Wharton Publishing.
[6] Katz, R., Editor, (1997). *The Human Side of Managing Technological Innovation.* Oxford Oxfordshire: Oxford University Press. *Managing Creative Professionals* (Albert Shapero), p. 55

Appendix A: Big Idea Group (BIG)

Michael Collins founded the Big Idea Group during the summer of 2000 as a company that would use collective intelligence to generate innovative ideas. In the context of the *Collective Innovation* process, BIG primarily offers first stage (Idea Generation) capabilities for its clients, although some engagements extend into the second (Idea Development) and third stages (Idea Prioritization) as well. During the last 6 years, Collins and BIG developed a unique engagement process that allows them to carefully target the needs of their clients with a customized idea generation approach that suits their specific needs. Consider the following process steps:

An organization approaches BIG with a problem. The organization may need to optimize an existing process or set of processes. Or, the organization may be interested in finding ways to improve an existing product or service. Alternatively, the organization may be interested in creating new, substantial growth through innovation and may engage with BIG to help develop a new product or product category. BIG's process is designed to assist organizations with problems ranging from savings ideas to incremental innovations to radical innovations.

Figure 21: Big Idea Group Webpage

Once the engagement begins, BIG works with the client to fully understand the problem in question and the types of ideas that the client would like to generate through the engagement. BIG then pulls together a user community, a group of individuals who are users of the particular process that needs improving or who are customers for the existing product or service or the prospective product or service. If the engagement demands it, the user community may be employees of the client or customers or non-customers. Ultimately, BIG pulls together a user community that is diverse and broad enough to generate a wide range of perspectives, yet small enough to be manageable – the usual community numbers in the low-to-mid hundreds range.

BIG then conducts a 'jobs-to-be-done' study of that user community. Specifically, BIG probes the community for the jobs that the users are attempting to accomplish through the purchase of the particular product or through the use of the particular service. BIG investigates likes and dislikes, queries for suggestions and complaints, and also identifies particular sub-segments of the community, such as 'lead users' or 'non-customers.' Through this process, BIG develops a list of user needs, unmet desires, and suggestions for process, product, or service

improvement. The BIG team then transforms this list into a 'request for invention, a 20 to 30 page document that articulates the client's specific goals, the user research results, and the types of ideas that both BIG and the client are looking for. Of particular note, the request for invention will include any constraints set by the client (e.g. ideas cannot include a particular ingredient, must use specific materials, or must fit within a specific range of price points).

Throughout the year, Collins and other BIG employees travel around the United States, and meet with individuals self-described as 'inventors' through what they term 'roadshows'. At these events, BIG representatives describe the company and its approach to inventors, but most importantly, spend time interviewing all the inventors present. BIG develops detailed profiles on each attendee inventor, ranging from experience to particular interests and skills sets, and adds the individuals to its own proprietary database of inventors – as of mid-2007, the database contained greater than 12,000 inventors.

Once BIG and its client complete the 'request for invention', they send the document to a carefully chosen sub-segment of the inventor database in what is known as the 'ideahunt' phase. The inventors are given a specified length of time during which to generate ideas and when the deadline passes, BIG will have often received several hundred ideas extending along the entire gamut from the most incremental innovations to the most radical. Once the ideas are organized, the BIG team, along with representatives from the client, devotes time to combining like or repeated ideas and to culling out ideas that are simply impossible to execute or do not fit the request for invention. Usually, from an initial base of several hundred ideas, the BIG team will produce a final list of around 100 or so ideas.

In the third phase of the process, the final list of ideas will be returned to the user community. The user community takes time to review the ideas, rejecting some, developing other ideas further, and ultimately giving ideas a 'thumbs-up' or 'thumbs-down'. Sometimes this

process will cull the list of 100 ideas down to just a few ideas or in certain cases, a large percentage of the ideas might draw the approval of the user community. BIG then turns the ideas that make it through this vetting process to the client.

After reviewing the list of ideas, the client may select just one or several to license. Sometimes clients select ideas that have survived largely intact through the entire process and sometimes clients will request that a number of ideas be combined (e.g. an ingredient from one, a packaging idea from another and a third branding concept). The BIG team works with the client to select the appropriate ideas and then works out an acceptable licensing and compensation agreement with the inventor. Generally, BIG and the inventor split the compensation equally. The user community, meanwhile, receives limited compensation in the form of free product, an opportunity to participate in a drawing for a larger reward, and the gratification of helping a favored company or brand. BIG also reserves the right to capture any ideas generated throughout the entire engagement. If the client declines to license a particular idea, BIG is free to take the idea for itself and to build a new business around the idea or monetize the idea in another fashion.

Ultimately, BIG offers organizations a resource that they could not afford to develop in-house. Whereas BIG can spread its carefully constructed database of inventors across a wide range of products and industries, it would rarely make economic sense for an organization to build and maintain its own database of inventors. Furthermore, if an organization's particular competence is execution and exploitation, it stands to reason that exploration should be left up BIG, an organization for whom exploration is its core competence. Finally, BIG keeps tight, contractual, intellectual property control over both the user community and the inventor, ensuring that the traditional dangers of public information disclosure are avoided.

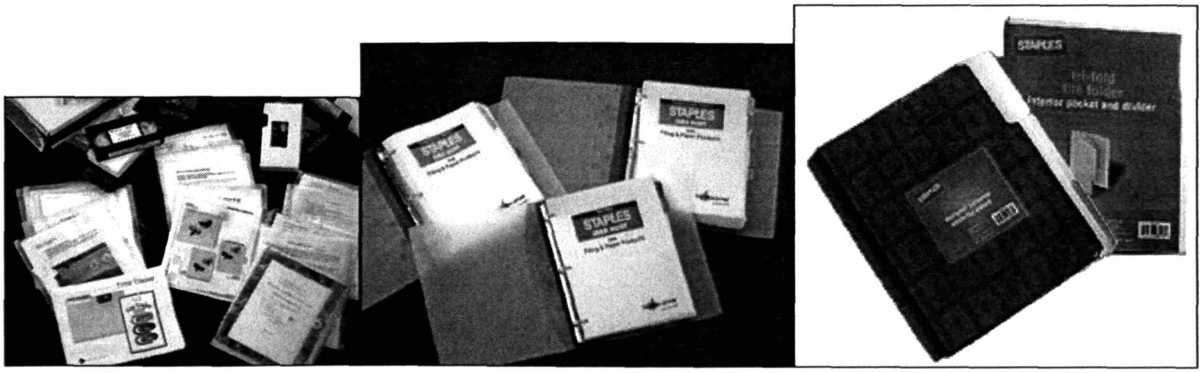
The BIG case is an example of the External (Outsourcing) *Collective Innovation* strategy. An organization, large or small, can focus on its core competency – bring existing products and services to market – while hiring BIG to help generate new ideas for those products and services or for new products and services altogether. Organizations that pursue an Internal (One Division) or Internal (Two Division) *Collective Innovation* can also engage BIG to create a hybrid Internal/External model in which BIG supplements internal exploration.

Based in Manchester, New Hampshire, BIG has 24 employees and from a $420,000 loss in its first year of operations (2001), generated $6.95m in profit in 2005 with projections to nearly double that profit to $12.4m in 2006. BIG can be found online at: http://www.bigideagroup.net/.

The following example, sourced from the Big Idea Group website, details a real-world engagement between BIG and Staples:

Staples Idea Hunt[1]

BIG and Staples identified an opportunity for Staples to create private-label products that offered more innovative features and benefits than commodity goods. To keep inventors focused, the Hunt scope was narrowed to filing and note-taking products. BIG helped Staples articulate the guidelines, wrote the Hunt spec, and then publicized it to its network (via mail, email, and web). At the conclusion of the 6-week Hunt, 300 ideas were generated.



The ideas were then categorized, prioritized, and presented to Staples. Beyond organizing the inventions and ranking them, BIG also identified common themes. After several evaluation rounds, Staples focused on four innovative concepts. With the guidance of BIG, the inventors prepared more detailed presentations, including prototypes and/or product visuals, as well as positioning and packaging concepts. The first products from that Idea Hunt were a line of distinctive file folders.

Staples Invention Quest

The Idea Hunt also helped spur Staples to undertake an even bigger innovation initiative: The Staples Invention Quest.

In 2003, Staples inaugurated a nationwide consumer contest for the best new concepts in office supply products. The main goals of the contest were to discover innovative products to fuel Staples' private-label brands, to generate positive PR, and to drive traffic to Staples' retail sites.

Working with both product development and marketing specialists at Staples, Big Idea proposed, outlined, managed, and helped judge the event. Culling through nearly 8500 submissions, BIG identified the best [ideas] for invitations to the Semi-Finals, which [BIG] organized and ran. The process culminated in a best-of-the-best competition among 12 Finalists in New York City. The event, staged at the New York NASDAQ, generated national media coverage, including inventor appearances on Regis and Kelly. The grand prize of $25,000 was awarded to the WordLock, an innovative lock that uses letters (and words) instead of numbers.

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[1] Case drawn from http://www.bigideagroup.net/success/staples.htm (Accessed 10:40am, 4/10/07)

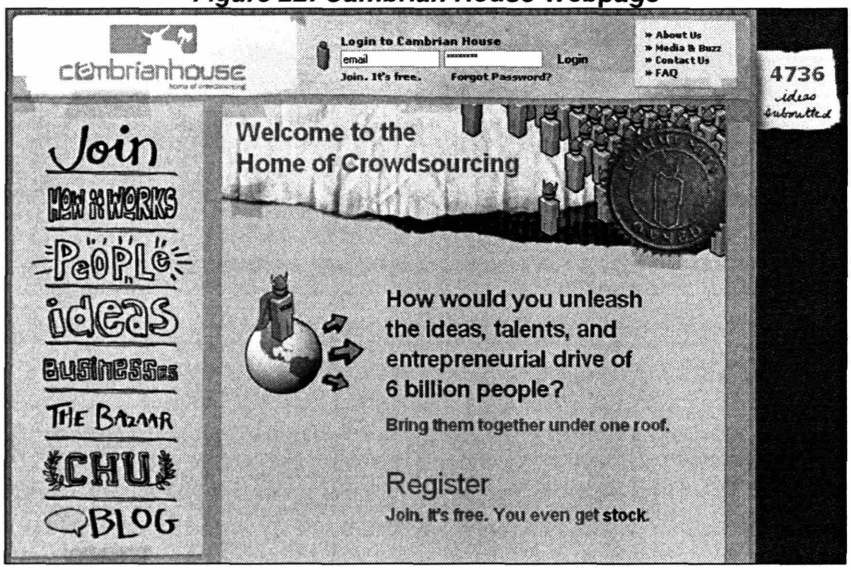
Appendix B: Cambrian House

Founded by Michael Sikorsky in December 2005, Calgary, Canada-based Cambrian House (CH) is a firm leveraging collective intelligence and open source to create and develop new business ventures. To this point, the company has primarily focused its efforts on software development, but is exploring new ventures in areas as diverse as charitable foundations and television programming.

The CH venture creation process works as follows: CH invites anyone on the Internet to join the CH community and to submit ideas to the community with the promise that if a particular idea ultimately generates revenue, the submitter will share in that revenue. As ideas are submitted, the CH community vets those ideas and contributes suggestions to further develop ideas considered potentially valuable. To this end, CH connects the users in the community with each other through collaboration tools such as comment pages, friend lists, blogs, and RSS feeds. In addition, community members can form ad-hoc teams to develop specific ideas into business ventures.

Community members who submit and vote on ideas, post messages in the CH forums, and contribute in other ways receive 'Glory Points' as well as shares in CH itself. On a public leader board, members are ranked based by their Glory Point totals. As of spring 2007, CH had also set aside 260,000 shares in the company for its members, each of whom receives one share simply for joining the community and can earn others through participation.

Figure 22: Cambrian House Webpage



As community members review ideas, they are encouraged to rank those ideas on a scale from 0 to 7, where 0 represents 'no intent to purchase' and 7 represents 'I'd buy it.' Regularly, CH then sponsors 'IdeaWarz', a tournament-style competition in which highly-ranked ideas compete head-to-head for votes from the community. Much as with sporting events, the first round of an IdeaWarz tournament features 16 ideas in 8 competition pairs. The submitters or proponents of each of the two ideas in a pair create demos, prototypes, or mock-ups for the community to view or interact with in attempt to gain votes. After a certain period of time passes, the idea that receives a greater number of votes than its competitor continues on to the next round where it is paired up with another idea. The process continues until one idea wins and receives a small amount of funding to encourage further product development.

Ultimately, the winning idea requires further funding to become viable businesses and CH works to connect the top ideas in each IdeaWarz tournament to sources of venture capital. CH also recently formed a $100 million venture capital fund in a partnership with a venture capital firm to better facilitate the capitalization of new ideas. When an idea is launched as a new business, the community members who participated in developing the idea may have the

opportunity to join the business or otherwise receive a previously agreed upon amount of 'Cambros', a CH currency that they can 'cash out' at any time with an exchange rate of 1 Cambro to 1 U.S. Dollar.

By taking advantage of 'crowdsourcing', the outsourcing of jobs or tasks to online users or communities, CH is betting that it will become a pipeline of new ideas that it can rapidly spinout into new ventures. [1] In the context of *Collective Innovation*, CH is one of the best examples of an organization using the masses to generate, develop, prioritize, and execute new ideas through a connected, open, and collaborative process. Although CH is more an 'idea factory', the CH model could be implemented by organizations as part of their exploration efforts or as their entire exploration strategy in an Internal (Two Divisions) approach. Similarly, CH could also operate in an External (Outsourced) model as an organization creating new growth businesses for other organizations.

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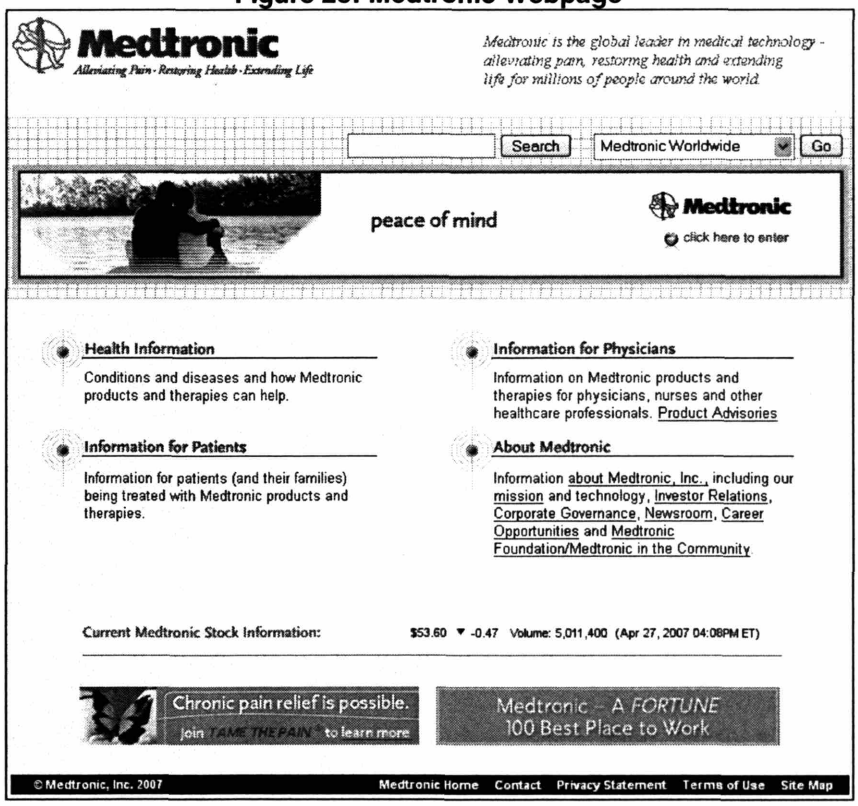
[1] http://www.wired.com/wired/archive/14.06/crowds.html (Accessed 10:01am, 4/25/07)

Appendix C: Medtronic

Medtronic is the largest medical devices company in the world and creates healthcare technology solutions to address the challenges of hearing and vascular disease, neurological disorders, chronic pain, spinal disorders, diabetes, urologic and digestive system disorders, and eye, ear, nose, and throat disorders.[1] Today, within its largest business unit, Medtronic has two divisions, one focused on exploitation – driving product evolution and superiority in current markets – and one focused on exploration – finding new opportunities and disruptive technologies.

Before examining Medtronic's current approach to innovation, it is essential to understand the Firm's past. Medtronic was originally founded by Early Bakken, an inventor who developed several of the core technologies that made the cardiac pacemaker possible. In the early 1950s, Medtronic created the cardiac pacemaker industry and from the early 1950s through the late 1960s, Medtronic dominated the market for pacemakers with greater than 70% market share.[2] From the early 1970s through the mid-1980s, Medtronic remained profitable yet suffered a significant loss of market share.

Figure 23: Medtronic Webpage



In 1997, Medtronic's struggles and subsequent resurgence in the late 1980s and 1990s was the subject of a Harvard Business School case written by Professor Clayton Christensen. Initially, the case illustrated how "increasing competition, rapid technological change and tightening market and regulatory demands for product quality" reduced Medtronic's market share "by more than half between 1970 and 1986."[3] The body of the case focuses, however, on how Medtronic was able to turn itself around through both good fortune and careful managerial tactical and strategic decision-making in 1987 by Mike Stevens, one of Medtronic's Vice Presidents.

Under Steven's guidance, Medtronic was able to recapture much of the momentum that it had enjoyed the prior 20 years. First, an employee within the company came up with an idea for a new and innovative pacemaker design that would adapt to the activity needs of its human host. According to the case, the product, which was launched in 1986, "...literally saved

Medtronic because no other new platform products were ready for introduction until 1992."[4] According to MIT Sloan School of Management Professor Rebecca Henderson, this new product gave Medtronic a 'breather' and provided temporary relief from pressure during which Stevens could begin to reshape Company operations.[5] According to both Christensen's Case and Henderson's analysis, Stevens set clear goals for the organization, authored and publicized a new management strategy, revamped Medtronic's incentives and processes, and created a 'burning platform', a sense of crisis to drive action. Finally, Stevens' direct approach and immediate follow-through gave him the necessary credibility with both Company management and rank-and-file employees.

Once again, Medtronic began to bring new technologies and devices to market before its competition and overall speed-to-market increased significantly. The Company focused on improving technology and component re-use resulting in a significant increase in product quality and reliability and decrease in cost of development and production. Medtronic also built strong relationships with its key customers and regularly polled them to ensure knowledge of current and future market trends. According to the Christensen case, Medtronic's market share in its core pacemaker business "increased from 29% in 1986, to 51% in 1996 [and] Medtronic was the leader in every segment of the market".[6]

Having revamped its strategy and re-established its market leadership, Medtronic divided its largest operating segment, Cardiac Rhythm Disease Management (CRDM), into two divisions to improve the Company's ability to simultaneously exploit and explore. As part of our research, we spoke with individual in charge of the CRDM exploitation efforts, Warren Watson, Vice President, Cardiac Rhythm Disease Management and Vice President, Implantable Product Development. We also spoke with the individual in charge of CRDM exploration efforts, Ursula

Gebhardt, Vice President, Research, Technology, New Therapies, and Diagnostics in the Cardiac Rhythm Disease Management Division.

As noted previously, Watson's division is focused on driving product evolution and superiority in current markets while Gebhardt's division is focused on finding new opportunities and disruptive technologies. When interviewed separately, both Watson and Gebhardt first discussed the power of such a two-division strategy, enabling both divisions to develop the processes and approaches necessary to support their own individual missions. Watson and Gebhardt also emphasized the unique value generated by the dialogue, debate, and rich information exchange that takes place between their divisions. Indeed, given their contrasting missions, each division seeks funding for different types of projects and initiatives but they must work together to identify the optimum balance for the Company as a whole.

Both divisions have some similar processes in place to create value through innovation. Both divisions use a 'stage gate' strategy when allocating resources to projects, funding both incremental and discontinuous projects in phases while reserving the right to increase or decrease funding as project progress demands. It is easier for Watson's division to set specific financial or progress targets for each stage while Gebhardt's division must focus instead on trials or other, more flexible, stage gates. Similarly, projects in both divisions go through a phase review process through which project teams check in with division management once a particular stage is completed or if there is an unexpected positive or negative event.

On this particular note, some of Medtronic's processes have changed substantially since the Harvard Business School case was written on the Company in 1997. In the late 1990s, for example, Medtronic instituted a policy through which all project teams would meet with division management on a regular basis (such as each month) regardless of stage length or progress.

As told to us by Watson, this policy was altered in favor of the current stage gate-based meetings to save time and to give project teams a greater level of decision-making responsibility.

The Christensen case also noted the use of a new product development strategy implemented by Stevens called the 'train schedule'. Much as a train schedule notes when specific trains are to leave a station during a particular day, Medtronic began to set specific future launch dates for new products beginning in the late 1990s. More specifically, the launch dates also detailed which features and functionality would reach market on each new product or 'train'. In the event that customer needs changed late in a product's development or that a certain feature would not be ready to go to market with its product, the train schedule let internal teams know when the next opportunity might be to tweak a product or bring a particular feature to market. Specifically designed to set internal expectations, the train schedule helped bring a fixed, cyclical rhythm to the firm's product development cycle. According to Watson, Medtronic continues to schedule products for launch, but if a feature requires additional time for completion, the particular product will be delayed until it is ready to go to market, rather than launching with a feature left for a future product; Watson explains that this approach was more realistic, given market realities.

Medtronic's strategy is an example of how an Internal (Two Division) *Collective Innovation* strategy might work. An organization, large or small, can separate its processes into two separate divisions and give them the opportunity to do what they each do best – exploitation or exploration. Given the need for space and the freedom to develop unencumbered, geographic separation of the divisions may be essential in some cases. Once the two divisions are in place, the organization must focus carefully on establishing and supporting connections, both formal and informal, between the two divisions.

Founded in 1949 and based in Fridley, Minnesota, Medtronic has greater than 30,000 employees, generated $11.3b in revenue for FY2006, and $8.5b in profit for the same time period. For FY2006, the Cardiac Rhythm Disease Management (CRDM) generated $5.2b or 46% of Medtronic's overall revenue. Medtronic can be found online at http://www.medtronic.com/.

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[1] *Medtronic 2006 Annual Report* (http://www.medtronic.com/annual_report/reports.html)
[2] Source: Medtronic, 2007
[3] Christensen, C. *We've Got Rhythm! Medtronic Corporation's Cardiac Pacemaker Business.* Harvard Business School Case Study, 9-698-004, July 8, 1997. p. 1.
[4] Ibid., p. 4.
[5] MIT Sloan School of Management, Course 15.912 (*Technology Strategy*), Lecture on April 12, 2007
[6] Ibid., p. 10.

Appendix D: Rite-Solutions

Rite-Solutions is a technology services firm serving the US Department of Defense by offering products which include complex systems engineering, complete network design services, and high-fidelity modeling and simulation systems. Recently, Rite-Solutions has also expanded its product portfolio and customer base with solutions that focus on the gaming and consumer entertainment industry.

Despite its conservative history and industry, Rite-Solutions features arguably one of the most unique and creative applications of *Collective Innovation* tools. Specifically, the company operates an internal prediction market which relies exclusively on employee participation to determine the strategic direction of the firm. To hear management speak about the market, however, they contend that the company's success has less to do with the market and much more to do with the careful design of the company and its culture. In fact, the two founders, Jim Lavoie, CEO, and Joe Marino, President, insist that they began the company with the intention of running it "the way [they] always thought a business should be run."[1]

The Prediction Market: Mutual Fun

Rite-Solutions' prediction market, affectionately referred to as 'Mutual Fun,' functions like a traditional stock market, but features stocks tied to potential company initiatives. These initiatives can represent cost saving initiatives, product ideas that are core to the company's current lines of business or longer-term investments that may develop into entirely new products serving a different customer segment.

Figure 24: Rite-Solutions Webpage

In line with management's penchant for ensuring the workplace is light hearted and "fun," the co-founders created three indices which comprise the stock market and reflect each of the segments described above: Savings Bonds (cost saving initiatives), Bow Jones (improvements to core business), and Spazdaq (new business ideas). All of these ideas reflected in the traded stocks originate from the employees of the company. Employees are encouraged, even expected, to contribute to the market by submitting ideas or trading existing ideas. Mutual Fun also includes IPOs and roadshows promoting a new stock listing.

The idea lifecycle is as follows: When an employee comes up with an idea, she must convince another colleague to serve as 'Prophet', an advisor that helps the employee move the idea along the path to execution as a business initiative. In addition to basic assistance, the Prophet also serves as an integral part of a 'two-person test' – if an employee cannot find someone else to support their idea, the idea is most probably without merit.

After securing a Prophet, the process of gathering feedback from colleagues continues through a road show to gauge the reaction of a larger subset of the firm's employees. If there is sufficient interest, the next step is to engage senior management, which evaluates the idea and decides to list (or not list) the stock. If management feels that the idea is worth listing in Mutual Fun, the Prophet and the employee who originated the idea must draft an Expectus, Rite-Solutions' equivalent of a prospectus. Finally, the stock's IPO occurs with an opening price of $10 per share and trading begins.

One a stock is listed, all employees can view the online Expectus which, in addition to describing the details of the idea, lists the tasks needed to execute the idea. While employees receive $10,000 of play money that they can use to buy and sell shares of stocks, in a unique twist, employees can also volunteer their time to complete those tasks. Of note, the price of a particular stock is tied heavily to employee volunteering and only slightly tied to actual trading. Due to this dynamic, the ideas that rise to the top of the stock market are those to which employees have contributed their own time and energy to support.

Over time, stocks rise and fall in the market. If employee commitment to a stock is sufficient to move the stock to the top of the leader board, management then decides whether or not to provide Adventure Capital, corporate funding for the idea. If management supports the idea, the idea then becomes an official company project.

A unique component to Rite-Solutions' approach is that before management decides to take on the project officially, all time spent developing the idea or shopping it around to gather feedback is time spent above and beyond the normal course of business. That is, employees are not given a reprieve from completing their normal responsibilities, which brings us to one of the most unique aspects of Rite Solutions, the company culture.

Company Culture

While Marino and Lavoie recognize the strategic value of Mutual Fun and related processes, both emphasize that Mutual Fun is primarily a tool which they use to engage their employees and to support the unique Rite-Solutions culture. In fact, Marino and Lavoie continually refer to Rite-Solutions as not a company, but as a community. They emphasize that work at the firm is merely an extension of the social and spiritual communities of which everyone at work is a part when they are not physically in the offices. Marino and Lavoie view themselves as the 'mayors' of a community, charged with caring for the environment in which they live and work and for ensuring that their constituents (e.g. the employees) are happy and do a good job.

At the core of the company culture lies the puzzle (See Figure 25) which represents the way that Marino and Lavoie view their relationship with employees. It is strikingly simple and obvious in many respects, but at the same time the approach is uncommon as a managerial philosophy.

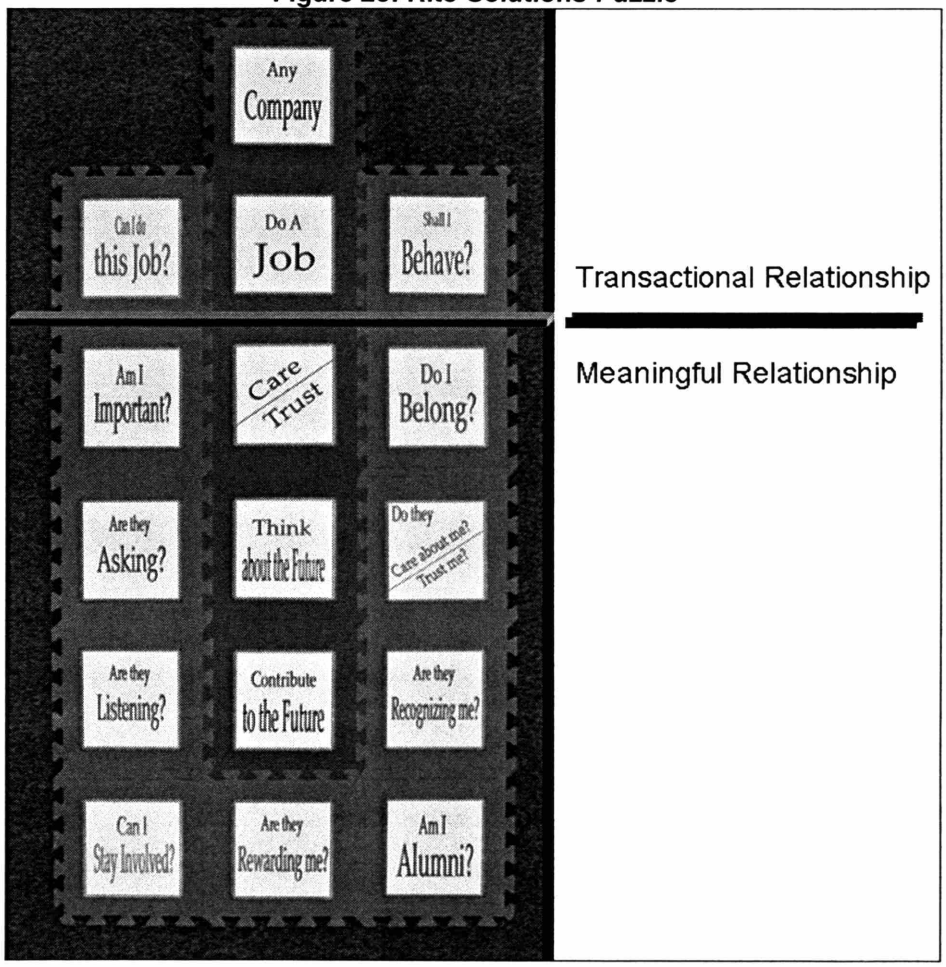
One can observe two distinct sections to the puzzle, the Transactional Relationship section and the Meaningful Relationship section. The Transaction Relationship section illustrates the traditional work-for-hire agreement between an employee and employer. In Marino's words "You have a job. If you can do the job and behave, we have a deal."[2] However, both Marino and Lavoie see the value in moving beyond this arrangement and to create a community, complete with deeper, stronger relationships. As Marino continues, "You really want the employee to care and trust the company, think about its future, and contribute to its future. Unfortunately, management and leadership have to play a lot more pieces [of the puzzle] to get the employee to play the pieces. This is why things start on day one."[3]

To this point, Rite-Solution begins this relationship on an employee's first day with a celebration. Instead of celebrating when a person leaves the company – which is a rare event – the office holds a 'birth party,' a party for each person on their first day akin to celebrating the birth of a new child in the community. And people play a part in the community in many different respects beyond their daily tasks of which the market plays a part. What is more, the ties to the Rite-Solutions are not severed upon retirement – Marino and Lavoie have put into place a "knowledge tethering" system such that retirees can remain connected to the company and can continue to contribute such that their experience is not lost upon their departure.

Rite Solutions is an example of harvesting collective intelligence to inform and even direct business strategy while simultaneously emphasizing culture and community. Organizations can use *Collective Innovation* tools such as prediction markets to "unleash the quiet genius" as described by Lavoie, but the solution is incomplete without carefully and intentional thought given to the culture and processes that will support the collective solution in its entirety.

Founded in 1979 and based in Middletown, Rhode Island, Rite-Solutions is privately held and has 160 employees. Rite-Solutions can be found online at http://www.ritesolutions.com/.

Figure 25: Rite-Solutions Puzzle



[1] Authors' interview with Jim Lavoie, Rite-Solutions' CEO, and Joe Marino, Rite-Solutions' President, on March 29, 2007
[2] Ibid.
[3] Ibid.

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