MEASURING INTANGIBLES:
MANAGING INTANGIBLES FOR TANGIBLE OUTCOMES
IN RESEARCH AND INNOVATION

Dr. Elias G. Carayannis
Faculty of Management and Technology
and
Director of Research on
Science, Technology, Innovation and Entrepreneurship
European Union Center
School of Business and Public Management, The George Washington
University
Washington, DC 20052
Email: caraye@gwu.edu

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ABSTRACT

Knowledge sharing is critical to the success and survival of companies in knowledge intensive industries. It is essential to effectively measure knowledge creation and sharing to facilitate good investment decision making in knowledge management initiatives.

Investments in people and tools are the primary assets used in the creation of knowledge. An organization needs to understand what knowledge it is generating, how to capture it, and how to go about easily disseminating it. Tighter budgets are leading CEOs to ask for an accounting of the investments in knowledge management.

In articulating value, one must understand how much value currently exists, how value is being retained, and what potential value is in the pipeline. It will take time to develop the cause and effect linkages but we will improve our ability to do so with confidence that the relationships are valid. The primary challenges are whether solutions that are found for a specific case can be generalized and how to rationalize the proportion of benefit allocated to value adding components of knowledge management. Existing program management measurements have been applied to tangible outcomes of knowledge sharing, however intangible benefits may be slightly more elusive.

This paper will focus on the identification of intangible benefits, the cause and effect relationships, and the applicability of existing metrics to these intangibles. The premise is that existing measurements may not apply. The development of new metrics for managing intangible assets to obtain tangible outcomes is a necessity.

Keyword(s): Knowledge Sharing, Knowledge Management Metrics, Managing Intangible Assets, Knowledge Creation, Knowledge Extraction, Knowledge Use
1.0 Introduction

Return on investment is centered on effective management of assets towards the achievement of a certain gain or return. As the importance of intangible assets increases in terms of its impact on the valuation of companies, organizations must become more effective and efficient in the management of these assets in order to remain competitive and maximize shareholder value.

Organizations primarily categorize assets into four different groups. These are identified as Financial Capital, Human Capital, Intellectual Capital and Social Capital. Financial and human capital as their names indicate, are accumulations of the respective monetary and human resources, whereas intellectual capital is the accumulation of knowledge and know-how and social capital the accumulation of networking-based relationships that define and support communities of interest and practice.

Methodologies, processes and tools have long been established to effectively manage financial capital. It consists of the investment of financial resources in an organization in anticipation and expectation of a certain rate of return on the investment. The amount of investment and the amount of return can be precisely measured and as a result, subsequently managed.

The output of human capital operating within certain processes is also well understood and somewhat predictable. Through the consolidation of current estimates with historical records of actual output, organizations within certain industries can determine the amount of human resources to invest in order to produce a certain level of production or specific outcomes.

When it comes to the measurement and management of intellectual capital and social capital, the expertise of organizations greatly diminish. This is most likely due to the lack of ability to accurately characterize and measure these intangible assets. The tangible assets such as financial and human capital are fundamentally different than the intangible assets categorized as social and intellectual capital.

Intellectual capital is an agglomeration of explicit and tacit knowledge, codified information and intrinsic know how. It is rooted in the experience and expertise of the individuals belonging to the organization. Whether it is specifically documented and communicated or based on the “intuition” of individual decision makers, intellectual capital is clearly an asset that, if well managed, can provide significant added value to the worth of an organization.

Social capital consists of networking, relationships, and good will. It is built through awareness and trust of potential partners both internal and external to the organization. An individual must first identify that another individual or organization has knowledge that if acquired, would lead to greater productivity in one’s activities or within one’s own
organization. The individual must then develop a relationship of trust so that knowledge is shared openly. An invisible as well as a visible network of peers develop relationships and implement processes which facilitate the sharing of knowledge. This is primarily done formally within a community of practice consisting of individuals with similar skills and responsibilities. It can also be very effective when done with complementary or overlapping communities of practice whereby an interdisciplinary approach to problem solving can be enacted. This can lead to superior solutions and subsequently to greater valuation and higher return on investment.

The following table provides examples of the types of capital, categorizing them as tangible and intangible assets.

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Type of Asset</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Financial</td>
<td>Tangible</td>
<td>Monetary Investment, Land and Buildings, Equipment</td>
</tr>
<tr>
<td>Human</td>
<td>Tangible</td>
<td>Manual Labor, Repetitive Tasks, Low-Tech Skills, Process Execution</td>
</tr>
<tr>
<td>Intellectual</td>
<td>Intangible</td>
<td>Process Generation, Best Practices, Experience, Intuition, Wisdom</td>
</tr>
<tr>
<td>Social</td>
<td>Intangible</td>
<td>Internal Networks, External Relationships, Communities of Practice, Goodwill, Shared Values, Internalized Standards</td>
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Intangible and tangible assets are not completely independent. Intangible assets coexist within the same organizational environment along with tangible assets and are impacted by management decisions either purposefully or unknowingly. Thus they should be co-managed by the development of an understanding of their relationships. This involves the act of comparing and contrasting the effects of changes in inputs and processes on the outcomes relative to tangible and intangible assets.

This paper addresses three key questions associated with the relationship of intangible assets to tangible resources and tangible outcomes:
1. Why is it important to measure the impact of intangible assets on tangible resources and tangible outcomes?

2. How can an organization measure the impact of intangible assets on tangible resources and tangible outcomes?

3. How can an organization manage intangible assets more effectively and efficiently to produce superior outcomes?

Business is conducted via an understanding and implementation of an economic model. The economic model is determined by the market place and the market forces associated with a particular industry. An organization will develop or adapt a business model based upon their desired role within an economic model. The business model is defined by business processes with which the organization performs its role. Finally, the business processes are supported by technology. In order to fully appreciate or determine the appropriate technology to support an organization, each of these layers must be understood relative to the particular organization (see Chart One).

[Insert Chart One here]

The business is managed by the monitoring of key indicators that provide an indication of the effectiveness of the use of key resources. Stockholders are looking for a certain return on the money invested in the organization. It is the responsibility of management to maximize that return while taking the strategic objectives of the organization under consideration. One organization’s most important objective may be simply to maximize profit. Another organization may have a strategic objective with the key consideration being that of growth or expansion. The senior management’s decisions
may lead to an optimal return on investment while achieving the more highly prioritized
growth objective.

In either case, the organization will use certain business measurements with which to
make decisions. In using a budgeting process to plan the use of resources, it begins with
the development of a sales or production forecast. Various segments of the organization
make a determination of how much resource (people, dollars, and capital) they will
consume in order to support this forecasted output. The resources are allocated to the
various parts of the organization. There is normally a negotiation component within the
budgeting process because resources are finite and therefore their use must be prioritized.

The resource requests and subsequent prioritization process utilize historical data to
estimate the expected return on the invested resources. Over time, the actual outcomes
are captured and assimilated into the model leading to the production of more accurate
estimates. The measurements of these actual outcomes are normally converted to a dollar
value that is ultimately considered in the determination of the return on investment of the
total organization.

Whether the primary strategic objective of an organization is profitability or growth,
the organization must have the ability to understand its use of resources and its
effectiveness in gaining benefit from this investment. Since the measurements of the
outcomes are used to determine the amount and timing of investments, it is important to
consider the total investments and total benefits. This statement begs the question of what
is missing from the measurement of outcomes. The answer is that the impact of
intangible assets is not accurately measured. Intangible assets have a positive impact on
the productivity of an organization. One important reason for understanding this impact
is to ensure that the organization makes the appropriate investment decisions. An objective of the budgeting process is to allocate the resources in a way to most effectively and efficiently reach the strategic objectives of the organization. This includes achieving a certain level of return on investment.

Stephen Denning [13] states that the most effective way to communicate is by telling a story. This paper will use the story of a large and truly global organization we dubbed "Global Knowledge Limited" (or GKL) to illustrate the importance of accurately measuring the impact of intangible resources on tangible outcomes. The authors do not expect that this story will have a springboard effect of causing organizations to reinvent themselves, however, the hope is that it will lead to a greater understanding of the need to measure intangible impacts. In that light, we move to the first of the three questions upon which this paper is focused.

The first key question is, “Why is it important to measure the impact of intangible assets on tangible resources and tangible outcomes?”

The premise of this paper is that an organization can be more productive by managing its intangible assets. If the impact of intangible assets on the actual outcomes is not adequately understood, an organization may not make the appropriate investment decisions. This is key because in order to effectively manage intangible assets, an investment of resources is required. The measurements of outcomes that are used in the budgeting process must contain an indication of the return on investment in knowledge management so that it can be properly prioritized among other investments.

GKL’s approach for implementing knowledge management is used to show examples of the kinds of problems and issues that arise when the outcomes of intangible assets are
not adequately represented in the budgeting or investment process. It will demonstrate the need for more functional and consistent measurements of the impact of intangible resources on tangible outcomes.

Richard Granger [18] in an Arthur D. Little, International report states that “industries heavily relying on knowledge seem to be valued relatively more highly.” Therefore this paper will focus on knowledge, the intangible asset that provides the most relative benefit to organizations. Knowledge management is the process used to increase the benefit obtained from this asset. This leads to another item to be addressed in this paper:

**The second key question is, “How can an organization measure the impact of intangible assets on tangible resources and tangible outcomes?”**

There are four steps that must occur in order for an organization to effectively measure intangible assets.

1. The organization must understand the intangible assets that it possesses.
2. These intangibles assets must be linked to tangible resources.
3. The results or outcomes must be included in the budgeting process.
4. There must be a continual cycle of “Link, Measure, Manage, and Budget” that will allow the effective operationalization of steps 1 through 3.

Once put in motion, there must be a continual flow in order for the process to be effective. This chart illustrates the concept of Link, Measure, Manage and Budget which will be addressed in more detail in the recommendations at end of this paper.

The GKL is used as a case study to illustrate the operationalization of the concepts presented in this paper. This case provides an example of the linkage between measuring
intangibles and the particular challenges facing a manager of knowledge management with regards to budgeting allocation and resource allocation.

The GKL case consists of a presentation of the business situation which existed at a certain point in time. The purpose of the case is to illustrate the complexity of the business decisions and to provide enough information from which alternative courses of action can be determined.

As the title of this paper suggests, it involves providing insight on how an organization can approach the implementation of a process to measure the impacts of intangible resources on tangible outcomes. By no means do the authors of this paper suggest that this is only course of action that can be concluded from the reading of this case.

2.0 Case Study

"Knowledge cannot start from nothing ... the advance of knowledge consists, mainly, in the modification of earlier knowledge."
- Karl Popper (1960)

Individuals and organizations are faced with an avalanche of data and information that may be critical in nature but hard to properly manage and leverage:

We must understand the role of knowledge management in fostering a synergistic symbiosis between information technology and managerial and organizational cognition. Both information technology and knowledge management can be perceived as strategic enablers of managerial and organizational cognition (Carayannis, 1998).

Carayannis [14] observes that while information technology can be considered as a value-adding technological infrastructure, knowledge management can be viewed as a socio-technical system of tacit and explicit business policies and practices. These are
enabled by the strategic integration of information technology tools, business processes, and intellectual, human, and social capital (The Conference Board, 1996). The advent of internet-related information technology such as intranets, extranets, and intelligent agents has contributed significantly to the increased interest in knowledge management: "Organizations are beginning to connect themselves in ways that they hadn't planned for or expected...Groups, departments, and teams suddenly find themselves being able to share information that they hadn't been able to share before." (Informationweek, 10/20/97). Finally, managerial and organizational cognition can be perceived as the human and organizational capability for individual and collective reasoning, learning, emoting and envisioning. Organizational memory, intelligence, and culture are important determinants of cognition processes at both the individual and the organizational levels (Carayannis, 1998).

Multiple studies have shown that superimposing technology on organizations is not the answer to cope with such challenges as information and cognitive overload straining limited resources like intellectual bandwidth and available time: “Employees will ignore, under-use, or subvert the most sophisticated technology of collaboration if they do not trust and respect each other, or if they lack a sense of mutual interest in common goals. The valuable potential of electronic knowledge tools can only be realized in an environment that encourages and rewards their use...” (Conference Board, 1996). In fact, mismatched information technologies and organizational settings have often given rise to what is termed as the information technology productivity paradox (Brynjolfsson, 1993, 1994, 1995, 1996). The "one size fits all" solution that technology vendors promote often does not work and it is in this very context that understanding the nature of
organizational culture and managerial and organizational cognition is key: “Many of the most valuable efforts to encourage knowledge creation and distribution have little to do with new technology, especially when the knowledge is complex and tacit, and therefore resists codification. In fact, some of the most productive knowledge projects are low tech.” (The Conference Board, 1996).

In the context of better understanding knowledge management, we need to focus on best practices for individual and organizational learning. For this we quote a study by the Institute of Learning that lists seven principles of learning:

1. Learning is fundamentally social
2. Knowledge is integrated in the life of communities
3. Learning is an act of membership
4. Knowing depends on engagement in practice
5. Engagement is inseparable from empowerment
6. Failure to learn is a common result of exclusion from participation
7. We already have a society of lifelong learners

The first principle addresses the relationship between social fulfillment and learning. Learning is enhanced by integration within the social environment of individuals and organizations. In GKL, this principle is supported by implementation of a holistic approach to development. This approach is inter-disciplinary in nature, taking into consideration social, political, and technical implications in the execution of development projects.
These principles are independent of technology and technological infrastructure. Their applicability to GKL’s business situation is independent of the tools involved in the implementation. GKL has adhered to the remaining Institute of Learning seven principles by the development of affinity groups and other complementary processes. Affinity groups have been identified as the “heart and soul” of the GKL efforts [Quoting a Senior VP of GKL]. The principle behind the formation of the affinity groups is to provide a forum for socialization among people with similar expertise and interests. The objective of this socialization is knowledge sharing within and among the various communities.

Knowledge within GKL is not created solely within an academic setting. In addition to being a product of the rigors of research, the majority of the GKL’s knowledge base is actually acquired via the execution of development projects. This is consistent with the principle of knowing by doing and by trying. The individuals within the organization enhance their knowledge and expertise by working on various projects often having similar characteristics but in totally different environments. These new situations force the individuals to be adaptive and enrich their specific expertise with contextual knowledge and application-specific insights.

Although GKL shares knowledge on a world-wide basis, each region has management autonomy. This is an important ingredient in the learning process. Individuals must participate in order to learn. This autonomy provides opportunities for members of departments to be engaged in truly meaning roles. Their decisions and actions have direct consequence on the outcomes. This situation not only increases the opportunity for learning per se, but also creates an environment to enhance the quality of learning and the creation of new knowledge along with the diffusion and absorption of
knowledge. GKL staff can better accomplish their mission by leveraging local, indigenous knowledge and know-how along with their in-house expertise, and in this sense,

As GKL develops the next steps along its journey of discovery, the remaining principles should be more effectively demonstrated.

Some of the questions that must be understood in the development of the next steps are:

1. Who is the decision maker and what is the critical choice being faced?
2. Who are the people/stakeholders/organizations truly desiring cross sector affinity groups?
3. What are their motivators? What are their obstacles?
4. How should cross-departmental affinity groups be funded? What is the feasibility of implementation?
5. What should be the criteria for evaluating the effectiveness of affinity groups?
6. What are the alternatives for the next steps with associated benefits and costs?
7. What is the status of the GKL’s efforts on each of the key dimensions of a successful knowledge management program?
8. How does an organization position itself through a change in culture, implementation of technology, and other methods to proactively adapt to ensure its success?
9. What are the key factors that characterize the current situation of the GKL?
2.1 Knowledge Management at GKL

Knowledge management can be viewed as the process for knowledge sharing. Information is defined as data arranged in meaningful patterns, while knowledge is an idea or fact that is believed and is reliable (Denning, 1998).

Moreover, the key dimensions of a knowledge program can be considered to be:

1. Knowledge management programs have dimensions of collecting and connecting.
2. Knowledge management programs include social processes by which communities of practice enable knowledge sharing to take place.
3. Knowledge management programs support the maintenance of beneficial external partnerships.
4. Knowledge management programs use information technology to assist in knowledge creation and knowledge use in addition to the most common aspect of supporting the dissemination of know-how (ibid.).

The need for sharing knowledge does not necessary stop at organizational boundaries. An organization can improve its knowledge management by the inclusion of the expertise possessed by its customers and suppliers. An organization may also benefit by sharing knowledge with other organizations within the same industry. Grouping these people into communities of practice and providing a technological infrastructure for sharing knowledge is one effective way of addressing this issue.
An indicator of the effectiveness of the GKL knowledge management program is the answer to the question, “what is the status of the GKL’s efforts on each of these key dimensions?”

2.2 Motivation for Knowledge Management Initiative

As we move into the 21st century, it is apparent that the most successful organizations will be those which promote a culture of creativity and innovation. The key to innovation is knowledge. It is not just data nor information alone that is required, but knowledge that can be shared among the shareholders in an endeavor sparking the imagination and leading to solutions that heretofore could not be speculated.

In 1995, GKL’s president announced a strategic initiative to reorganize and refocus operations to improve its accountability, efficiency and effectiveness. Central to the initiative was a plan to transform GKL into a knowledge based business. GKL was in a unique position to collect and redistribute all knowledge about development. This included knowledge related to task management, prior experiences, existing tools and, the expertise of external partners. The goal was that by the year 2000, the GKL would become a “knowledge enterprise.”

Since the implementation of the strategic initiative, GKL has become a sought after resource for knowledge on development issues. Within their departments, they publish a wealth of information which is used by organizations worldwide as input into their decision making processes. The expertise of their employees is acknowledged by both government and private industry. The GKL published a document that addresses the question of multi-disciplinary planning and promotes a holistic approach to development.
It emphasizes the consideration of social, economic and political factors while stressing the importance of partnerships among governments and the private sector with an orientation towards results. They state that investments should be made in developing indicators which are linked to learning and accountability.

In the 21st century, GKL and other successful institutions will utilize knowledge to stimulate creativity and innovation. These goals must be a integral part of the strategy of the organization. The GKL understands this concept and actions have been taken to position the organization to capitalize on its knowledge asset.

The following statements were agreed upon by GKL senior management which supports the knowledge management endeavor:

1. We will lose our competitive edge, unless we make knowledge an integral part of our ways of doing business
2. We will not succeed in our mission to fight poverty, unless we share knowledge on a much larger scale than we are used to
3. We will fail in our traditional business, unless we help our clients to exploit the opportunities which the economies of the 21st century will offer

This is an organization having the foresight to fully understand the role that they must play in the future to be successful. Having understood this vision, the next question is, “how does the organization position itself through a change in culture, implementation of technology, and other methods to proactively adapt to ensure its success?”
Most affinity groups are self-contained within an individual department. Funding is in a line item of the departmental budget. One major affinity group had no budget of its own, but instead depended primarily on funding from its three sponsoring departments. During its initial phase of operation, this was not a problem. All three sponsors recognized the joint value of the activities of the affinity group. Therefore, the affinity group simply proposed an annual plan of activities, which was presented to each of the sponsoring organizations. Each sponsor contributed a predetermined amount to the operating budget. Since this particular affinity group did not have its own budget code, this was actually a “virtual budget” assembled from the different funding pools. While the sponsors occasionally “earmarked” some portion of their funds for specific activities, in general the funds were pooled and used to support the full range of affinity group activities.

2.3 Emerging Organizational Problems

Beginning in FY2000, the organizational arrangement supporting the multi-sponsored affinity group began to break down. GKL’s implementation of an enterprise software system required that all activities of employees be strictly accounted for, with time spent billed to specific budget codes. Since this specific affinity group had no independent budget codes, all activities had to be allocated to one of the departmental sponsors. This created problems, as some activities were originally funded across sponsors. For example, programmer maintenance of the portfolio database was funded by one department, while updating the database content was funded by another. This arrangement could no longer be supported under the new accounting structure. Also, all
employees had to bill their time to specific budget codes, so the affinity group members were forced to relate every activity to one department or another.

The problems this caused for the multi-sponsored affinity group were immediately apparent. Now that activities were linked to specific department funds, no sponsor wanted to fund activities which would benefit other departments. Also, the affinity group had to develop a separate work plan to present to each of its three major sponsors. Finally, any activity of the affinity group members, even responding to small help desk inquiries, had to be attributed to one of the departments, even if the request came from elsewhere in the organization.

The creation of the affinity group formalized activities that had been working on an informal basis. As a result of the budget cuts, people were now charging for knowledge sharing that had been occurring freely between coworkers. The charge code process put pressure on the informal activities and destroyed a critical mass of trust among employees. Instead of creating a community of practice, formalization of the affinity groups created a community of standards.

As a result, “ear-marking” of funds by the departments became the norm rather than the exception. Sponsoring departments required that the affinity group conduct training seminars which addressed only issues specific to the individual departments. Some activities could be jointly funded, but the affinity group was forced to maintain strict accountability to demonstrate that the distribution of value generated by those activities matched the share of funding contributed by each department.

The sponsoring departments also began to withdraw funding from the multi-sponsored affinity group as they focused on their own specific mission priorities. The
affinity group was forced to seek special short term funding from a corporate department as opposed to the operational sponsoring departments. It is important to note that this earmarking of funds contributes to the ineffectiveness of the affinity group. If intangible assets are not explicitly earmarked with tangible resources, they will be prioritized lower than tangible assets and eventually may be eliminated from the budget. This was described as leading to the focus on financial drivers at the expense of strategic objectives. Intangible assets must be supported by tangible resources otherwise they cannot be leveraged. The benefit of intangible assets would not be reflected in the tangible outcomes.

The affinity groups may have exposed a flaw in the organizational structure which prevent the organization from thinking strategically and identifying superordinate goals. This may have been an indication that commitment to the affinity groups was not shared at a high enough level in GKL. Knowledge was not one of the primary outputs and was either not measured accurately enough or not important enough to fund adequately. This misaligned architecture plus the defensive environment caused dysfunctional behavior.

The situation was characterized by insufficient connectivity among people, resources and management structure that led to insufficient responsiveness across the organization. GKL effectively managed for a flat organization but the pervasive silos affected organizational behavior producing sub optimal outcomes. The sub par linkages between intangible assets and tangible resources and sub optimal or insufficient measurement technologies and tools prevented people in the organization from managing intangible assets effectively and efficiently.
2.4 Synthesis of Observations on GKL

There are a few themes which can be drawn from the story of the GKL’s implementation of affinity groups. The first is the complexity of the budgeting process in providing funding for activities that support the entire organization when the budgets are departmentalized. The second is understanding how organizational structure affects the ability of an organization to achieve its objectives. Although this particular story is about the GKL, parallels can be drawn to other organizations experiencing the similar situations. Therefore recommended courses of action for the GKL may be applied more generally to other organizations.

The GKL case provides insight to the first question posed by this paper as to why it is important to measure the impact of intangible resources on tangible outcomes. It is primarily based on the need to justify the investments required to implement an effective knowledge management program. Secondarily is it necessary in order to monitor progress.

Knowledge management has seven basic tenets (Denning, 1998):

1. Strategy - collective visioning as to how sharing knowledge can enhance organizational performance
2. Organization - to support enterprise wide knowledge sharing
3. Budget - appropriate funding needs to be provided
4. Community - based on affinity created by common interest or experience
5. Technology - must draw upon the tacit understanding of human beings (face-to-face, telephone, video will always be a part), must develop user friendly tools
6. Incentives - to change behavior from silo to horizontal focus
7. Measurement - necessary to prevent premature abandonment of successful efforts, justify knowledge management investment
GKL has made progress in some of the areas. They have developed a strategy upon which success is based on their ability to effectively share development knowledge on a world-wide basis. In doing so, GKL will become the benchmark for best practices.

The senior management of the GKL supports knowledge sharing at the enterprise wide level. However, whether the institution is properly organized and has the proper incentives in place to most effectively support this objective remains in question. The current budgeting process needs improvement. Once the process for sharing interdisciplinary knowledge is established, an appropriate method of funding must be established. The creation of affinity groups was the first step in organizing to promote knowledge sharing. These communities of practice are effective within specific knowledge areas. The organization must be improved in order to be more effective for sharing knowledge across disciplines.

[Insert Chart Two somewhere here]

In the 1950’s through the 1970’s, organizations collected data. They used this data to create products for internal use as well as the marketplace. From the 1970’s and into the 1990’s, organizations manipulated the data and derived information that was used to formulate solutions.

Carayannis [14] proposes that the primary process by which firms change their capabilities to better fit the environment is through learning. In the case of learning like the case of most other fundamental concepts, there is little consensus as to what learning is and how it takes place. In economics, learning is perceived as tangible, quantifiable improvements in value-adding activities, in management, learning is seen as the source of
"sustainable competitive efficiency" (Dodgson, 1993: 376), whereas in the innovation literature, learning is considered as a source of "comparative innovative efficiency" (ibid: 376). As noted in Doz (1996), there is a distinction in the organizational context between cognitive learning and behavioral learning. Cognitive learning occurs when members of a firm realize that some change is needed in a given situation; behavioral learning occurs when the organizational routines of that firm are actually changed (the implementation of cognitive learning). Expanding the concept of learning further, organizational learning occurs when the new behavior is replicated throughout the firm, leading to broad-based organizational change (Teece et al, 1997: 525).

It is this organizational change which will facilitate more effective management of knowledge within GKL. Organizational knowledge can be enhanced through the use of information technology and knowledge management processes. The tools and technology exists for GKL to more effectively implement knowledge sharing processes. This information technology is used to improve the technological infrastructure. There are also social-technological decisions that must be made by GKL. The resolution of the issues will facilitate GKL’s progress on improving their knowledge management program. More effective business policies and practices will be enacted to promote exploitation of the benefits of explicit and tacit knowledge.

In other words, GKL can take steps to unlock its knowledge potential. As an organization matures in its ability to manage intangible assets, it moves along a continuum from potential to added value. There are two stages of potential. Potential can be unrealized or realized. Unrealized potential is the situation where as an organization is unaware of the knowledge that they possess. They do not know what they know. As
awareness progresses, the organization begins to gain an understanding of their intangible assets but the environment does not provide the mechanism for leveraging what they know. In this stage the potential is realized but there is no value add.

In the later two stages of maturity, an organization does experience value add from the intangible assets within their control. However, in the third stage, the value added is not effectively leveraged. An example is the situation where an organization produces superior solutions but have sub par processes in place for execution. It has awareness but may not be able to leverage the knowledge because it is captured in an incomplete manner.

The final maturity stage is one in which value add is an extrinsic capability of the organization. This is characterized by an organization that produces superior solutions and performs via superior processes. The value add of the intangible asset is effectively captured and reflected in the tangible outcomes.

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<td><strong>Potential</strong></td>
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<td>Unrealized</td>
<td>Islands of Experience and Expertise</td>
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<td>Realized</td>
<td>Niches of Intrinsic Capability</td>
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<td><strong>Value Added</strong></td>
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<td>Non Leveraged</td>
<td>Superior Solutions and Sub Par Processes</td>
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<tr>
<td>Captured</td>
<td>Oceans of Extrinsic Capability and Achieved Outcomes</td>
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Organizational Life Cycle Maturity - 2000: Carayannis

### 3.0 Steps towards an “Organizational Ecology” of Intangibles Measurement
A major area within GKL in which very little has been accomplished is in the area of knowledge sharing measurements. Since much of the benefit associated with knowledge management is in the form of intangible gain, accurate measurements are necessary to justify investments.

[Insert Chart Three somewhere here]

It is not unusual that GKL does not have adequate measurements in place. According to Arthur D. Little (1999), there are no developed accounting practices for measuring most intangible assets. Albeit there are measurement techniques and standards for such intangibles as brand name and goodwill, there is nothing of the like for knowledge. This may be due to the complexity and interdependence of knowledge within the organization. It is extremely difficult to identify and value knowledge independently from the context in which it is used. This leads to the final question posed by this paper.

“How can an organization manage intangible assets more effectively and efficiently to produce superior outcomes?”

The answer to this question may be found through the implementation of an “Intangibles Management Lifecycle” (IML) proposed by Carayannis (GWU Working Paper, 2000) that consists of four stages for measuring and managing intangibles:

a. Link,

b. Measure,

c. Manage and

d. Budget

In implementing this IML, it is important that:

1. The organization must inventory and assess the intangible assets that it possesses.
2. These intangibles assets must be linked / mapped into tangible resources.

3. The results or outcomes must be included in the budgeting process.

4. There must be a continual cycle of Link, Measure, Manage, and Budget serving to increasingly fine-tune the process itself.

We now discuss in more detail each one of these key action items.

**Step 1: How can an organization inventory and assess the intangible assets in its possession?**

Sveiby offers an alternative to categorize intangible assets as relational capital, structural capital and human capital. An organization must identify the intangible assets that it possesses in order to understand the appropriate investments to make to ensure that the benefits from these intangible assets are optimized. Depending upon the industry and the organization, the intangible assets may vary. The list below is not all-inclusive, however, it will provide a basis from which an organization can begin to identify their own.

- **Relational Capital**
  - Relationships
  - Ethical Reputation
- **Structural Capital**
  - Effective Use of Knowledge
  - Codification of Tacit Knowledge
  - Intellectual Capital
  - Innovation
- **Human Capital**
  - Personal Growth
  - Enhanced Problem Solving
Step 2: How can an organization link intangibles assets to its tangible resources?

“Novel situations must be interpreted within the context of accepted frameworks of meaning, or else new interpretations must be constructed to sustain organized activity.”
- Linda Smircich (1982)

Although the existence of intangible assets is readily accepted, there are very few companies that measure the quantity or value of the intangible assets within their organization. This is due to the difficulty of establishing a baseline as well as the difficulty of measuring progress against the current baseline. In order to establish the current baseline, an expectation or criterion must be developed to gauge the quantity or value of the intangible assets. At that point, a methodology for collecting and reporting improvements to the baseline must be developed and implemented to track progress.

The intangible that will be the most crucial to the success of organizations in the future is knowledge. The effective management of knowledge will be the differentiator between success and failure. Therefore it is important that organizations gain an understanding of the affect that knowledge assets have on their outcomes. The baseline is the point from which progress will be measured.

The baseline should be constructed from three perspectives. It should include:

a. the perspective of the knowledge content creators,

b. perspective of the knowledge managers or extractors and
c. the perspective of the knowledge users.

The metrics developed will independently measure these three perspectives of the knowledge management value chain.

[Insert Chart Four somewhere here]
One of the most expensive resources used by organizations is the human resource. In many industries, training is very expensive. At a minimum there is lost productivity when less experienced people are performing skilled tasks. Therefore it is to the benefit of an organization to develop as steep a learning curve as possible. Knowledge sharing is one of the mechanisms for doing so. How much influence knowledge sharing has on increasing the speed of learning should be a key input into the decision of how much to invest in knowledge sharing.

It is readily accepted that access to information and the ability to question more highly skilled individuals can decrease the amount of time it takes for a person to improve their own skills. Two questions come to mind. One is, “what is the best method for imparting this knowledge?” The second question is “how much improvement can be attributed to knowledge sharing?”

The aspect of “best” method implies the ability to measure how well the knowledge is gained and used. Current metrics can only provide circumstantial support for describing a methodology as the best practice. In order to better define a process as a best practice, extensive benchmarking should be conducted. This compares the results of processes within the same industry or compares like processes across industries. The most effective processes are identified as best practices.

Step 3. **How can an organization measure the outcomes associated with intangible resources to provide input into the budgeting process?**
“It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change”
Charles Darwin

Effective knowledge management has emerged as a key characteristic of the most competitive organizations. Eighty percent of all businesses engage in some form of knowledge management [23]. The key competitive factors are knowledge creation, knowledge extraction and knowledge use. A general framework of technological learning is applicable as a subset of these factors [15].

The value that knowledge management brings to an organization must ultimately be viewed from the strategic perspective of the organization or unit involved. An organization may be engaged in the role of a knowledge creator, a knowledge extractor or a knowledge user. There are common measurements of the effectiveness of the implementation of knowledge management processes across these three roles, however, each perspective has uniqueness which require different measures or variants of the same metrics.

Some of the key concerns of knowledge creators in terms of measurements are the timeliness or speed of creation of new knowledge, access to knowledge sharing methods and innovation. The key concerns of knowledge extractors are the scope and age of knowledge content, potential uses of knowledge, and the processes and associated costs of knowledge extraction. The knowledge users are concerned with ease of use, ease of access, intuitiveness, and applicability of knowledge.

Arthur D. Little International Inc. has developed a world class product creation process which can be adapted to establish a baseline for the measurement of intangibles and the subsequent monitoring of progress. The organization rates itself on each
characteristic by making a determination of which narrative best describes its own implementation or achievement. A summary rating of the characteristics are then depicted on a word picture chart indicating the rating for today and the target rating. It also allows for a weighting of the priority of the desired change or target. This assessment and weights are used to determine the immediate actions (Authors Interview with ADL Director of KM, October 2000).

Knowledge management related questions can be incorporated into a similar tool to capture a point in time perspective of an organization’s knowledge management measurements. These points in time metrics can be trended to denote progress or digression. The questions should be stated in such a way that they produce a range from none to excellent broken into approximately four levels of execution.

Organizations monitor tangible results such as increased profits and reduced costs using traditional methods. As organizations invest more resources in knowledge management, focus will be placed on developing metrics that measure the intangible benefits of knowledge sharing. This will enable management to make more effective decisions related to the deployment of the organization’s knowledge management strategy thus leading to improved tangible outcomes. Existing program management measurements have been applied to this area with varying applicability.

**Step 4: What is the IML of Link, Measure, Manage, and Budget?**

“Cognition is the human capacity to perceive, interpret, and reason about environmental and conceptual environmental or organizational stimuli and meta-cognition the capacity to think about thinking, as meta-learning means to learn about learning”
(Carayannis, 1994)

The typology of operational technological learning (Carayannis, 1998) applicable to the IML process of Link, Measure, Manage and Budget should be considered in the development of a knowledge management program and the subsequent metrics. It identifies the type of tacit and explicit knowledge used by an individual or group when engaged in operational, tactical or strategic learning and may help map intangible into tangible knowledge.

This intangible knowledge must be linked to tangible resources in order to effectively measure and manage for obtaining the optimal benefit. If knowledge is not one of primary outputs of an organization, it is not often measured enough or important enough to devote resources to. How do we provide the tools by which the GKL can measure the value of knowledge management to its core strategic goals? The appraisal of the changes in intellectual assets created is very elusive. Criteria must be defined and standardized in order to make an assessment. GKL must learn to measure creativity and the creation of new knowledge. The supposition is that had they access to knowledge sharing measurements, it could have influenced the organizational decision in a more effective direction. Without the benefit of linking, measuring, managing and budgeting, a logical argument containing quantifiable facts could not be presented.

Arthur D. Little has described a value necklace flow that represents a similar process to that of link, measure, manage, and budget. It illustrates how capturing knowledge is a continuous process. The roles of knowledge creator, knowledge extractor and knowledge user are dynamic. An individual may participate in all three roles. For example, during the use of knowledge, new knowledge may be created. In this case person acting in the
role of knowledge user suddenly becomes a knowledge creator and thereby should perform the appropriate activities associated with knowledge creation.

Once knowledge is created, it must be made available to be acquired and subsequently selected via a search by a knowledge extractor. It is then evaluated and employed by a knowledge user. Through the process of synthesis, the knowledge is cataloged and stored for later review and ultimately purged. In the process of evaluation, the knowledge extractor may indeed add value and thus become a knowledge creator as well. All newly created knowledge must be found its way back to the beginning of the cycle in order to be made assessable to knowledge extractors.

Superimposing the knowledge creation, extraction, and use value chain over the value necklace for acquiring knowledge, results in the framework for the Link, Measure, Manage, Budget process, there are activities and associated resource expenditures required to perform at each point in time. Each activity affected by intangible assets must be linked with the associated tangible resource expenditure. This is the first step in understanding what to measure on the resource utilization side. This includes the investment in the technological infrastructure required to support the processes as well as the investment in the processes themselves.

In addition to linking intangible assets to tangible resources, the intangible results must be linked to tangible outcomes. This provides the ability to create a proxy measure of the cost and benefits of intangible assets. This is not an exact science. It is not as important to measure the results accurately the first time as it is to establish a baseline upon which the measurements can be improved over time. In addition, with approximate measurements, better decisions can be made in the interim than with no measurements at
all. Given the ability to measure the cost of intangible assets and the benefits provided, facilitates the ability to manage the intangible assets. Without measurement, there is no ability to manage. Again this is an iterative process. The process of management implies feeding into the budgeting process to affect the resources applied to the intangible assets. The results are then allocated to the respective investments to assess the return. Since as stated earlier, industries that utilize knowledge will be valued more highly, this is a powerful incentive to maximize the return on knowledge.

Throughout the iterations, the linkages must be reassessed to improve the accuracy of the association of intangible assets to tangible resources. At the same time, improvement in the accuracy of the measurements will ensure that the ability to manage the intangible assets progresses.

The first organizations in knowledge based industries to master the Link, Measure, Manage, and Budget process will be able to capitalize on their intangible assets and become more competitive and successful. Organizations such as GKL, who have a wealth of specific knowledge upon with to draw have the opportunity to become recognize as world class in knowledge management. If done effectively, it could enhance the value of GKL beyond expectations.
REFERENCES


[2] Payne, Johnson “Improving Organizational Measurement”. Internal Revenue Service


Lack of measurement standards is a barrier to effective management.

**Experience**
There is simply no developed accounting practice for measuring most Intangible Assets.

**Complexity and inter-dependence**
Most Intangible Assets cannot be isolated from their context (e.g. employee motivation).

**Market**
The market for intangible assets is not as liquid as the market for tangible assets (e.g. machinery is traded more often than brand names).

**Challenge**
To construct a representation for Intellectual Capital that allows management to take effective action:
- to manage Intangible Assets
- to improve Shareholder Value.

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**Chart Four**

**Knowledge Management Value Chain**

- Knowledge/Content Creators
- Knowledge Managers/Extractors
- Knowledge Users

As illustrated by Carayannis & Webster, Sept 2000