Innovation Asset Management:  
A New Dimension for Enterprise Strategy

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Abstract

The paper presents a new approach to rising innovative capital of an organisation. We introduce a so-called Innovation Asset Management (IAM) framework, which defines a background for deployment of an IT solution for managing innovation assets of organizations.

We begin with a brief description of what constitutes an intellectual capital of an enterprise and define a place and a role of innovation assets within the context of intellectual capital. We also outline that know-how management has been considered as much more difficult challenge than management of traditional (protected) assets, such as patents or trademarks.

In the next section of the paper, we summarize objectives why organizations should seriously consider improvement in management of their know-how assets.

Further, we analyze Innovation Asset Management from three major perspectives: Knowledge Management (KM), which interprets innovation assets as a kind of knowledge assets and provides a common framework for cataloguing knowledge, skills, and competencies; TRIZ, which provides generic instruments and common methodology of management invention-level problems; and Best practices performance improvement approaches which make knowledge collected from best performers available to others.

Finally, we outline architecture of the framework for innovation asset management and define further directions for research.

Keywords: Intellectual Capital, intellectual property, technical know-how, knowledge management, asset management, TRIZ, best practice performance improvement systems
1. Introduction

Over past few years, the most valuable assets have gone from solid to soft, from tangible to intangible. Those assets come in form of patents, copyrights, trademarks, R&D results, ideas, others know-how. As pointed out in (1), "an ability to capture and leverage what employees know in order to exploit new markets or create innovative products or services is becoming a critical management science focus."

Some of these assets, such as patents and copyrights, have a long history and are protected by legal rights. Others (generally known as know-how), despite of being in the center of innovation processes, are often poorly identified, protected or managed.

How to improve the situation, how to make sure that "the right knowledge is accessible to the right people and the right time" (Gordon Petrash)? That work should be started from rigorous examination of know-how, related to products, services, or technical processes, and followed by cataloguing knowledge, skills, and competences the company possesses. These efforts will lead to creating more knowledge and maximizing the company’s “hidden value.”

In (2), Leif Edvinsson and co-authors from Scandia (insurance company in Stockholm, Sweden) have identified elements of Intellectual Capital (IC), which represent a hidden value of any company (as depicted on the diagram below).

![Elements of Scandia Intellectual Capital](image)

Figure 1: Elements of Scandia Intellectual Capital

As may be concluded from the diagram, the value of innovation assets constitutes innovation capital of the company. Innovation assets themselves consist of intellectual properties of the enterprise and its other intangibles.

The real breakthrough on innovation asset management or, more precisely, on its part related to patent portfolio, have been achieved by Gordon Petrash and colleagues working at that time at Dow Chemical. The model of Intellectual Asset Management developed by Petrash and his colleagues, involved six phases: strategy, competitive assessment, classification, valuation, investment, and portfolio. As written in (3):

[ The group started from patent portfolio phase. They identified each patent, determined either it is active or not, and found a business within Dow Chemical that had taken financial responsibility for it. Next one was classification phase. All the patents have been classified as "in use", "will use" and "not use" and, also, have been marked as whether they are licensed or abandoned.

In the strategy phase, the group linked patent portfolio with business objectives in order to maximize its value, and identified gaps in the portfolio that needed to be addressed...]

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Although there is a growing interest in how to manage know-how, “it’s still considered as a much more difficult challenge than patent management” (3). The objectives, why organization may undertake this initiative can be different:

- Applied know-how can enhance the value (and hence the price) of products and services. From the investment perspective the research conducted by (4) has revealed, that approximately 35% of the investment decisions are influenced by non-financial data.
- There is well-recognized inefficiency in protecting intangible assets, usually referred by the term 'know-how'. As reported by Paul Plevin\(^1\), a study suggested that 79% of employees steal from their employers to the tune of more than 120 billions dollars per year, and “the cost of theft of physical items like paper, pens, office supplies and even computer equipment pales in comparison to the cost of losing a company-s lifeblood, its valuable trade secrets...”. When it makes sense, organization may undertake efforts trying to transform their “know-how” into patentable or other form, which provides better protection. Patents have high commercial and transactional value, and, depending on innovation, may provide crucial advantage over market competitors. Patents can be licensed, sold, leveraged during acquisition and merging, and are considered as essential factor for the firms looking for alliances, partnership, and collaborative environment. Patenting the idea can block competition.
- Know-how initiative will ensure that “the right knowledge is accessible to the right people at the right time” (G. Petrash) – even when organizations downsize or restructure, they can prevent costly mistakes and reinventing the wheel.
- Through sharing best practices organizations may save millions a year by taking the knowledge from best performers and applying it in similar situations elsewhere. A Fortune 100 insurance company reports that through the use of the tool for collaborative capture the best practices and transforming them into learning content they saved millions of dollars by improving operational effectiveness of the claims processing function.

We believe, that Knowledge Management (KM) technologies, extended with tools and instruments for collaborative learning and TRIZ-based computer-added innovation (CAI), provide a meta-platform for successful deploying innovation asset management.

Let us briefly discuss knowledge management, TRIZ-CAI and Best Practice Improvement technologies and tools in context of Innovation Asset Management framework.

2. IAM within the Knowledge Management context

Gartner Group defines knowledge management as a discipline that provides an integrated approach to identifying, capturing, evaluating, retrieving and sharing enterprise information assets. Knowledge management is not only about managing these assets but also managing the processes that act upon the assets. According to (5), “real value comes in the practices and processes that change the organization culture and practices and is derived from tapping into intellectual capital and harnessing the experience of employees.”

There exist two types of knowledge in organization: tacit knowledge and explicit knowledge. Tacit knowledge is developed from experience, it is not structured well and it is difficult to communicate. Explicit knowledge, vice-versa, is much better formalized, structured and well documented.

We consider innovation assets as a kind of knowledge possessed by organizations, which co-

\(^1\) See http://www.paulplevin.com/frames/frame_articles.htm
exist in two forms mentioned above. It is unlikely to believe that tacit and explicit knowledge related to innovation can be managed in the same way. To remedy a situation, we offer two initiatives within the IAM framework: one which is related to sharing tacit knowledge and other to sharing explicit knowledge.

Explicit knowledge presenting in innovation assets – patents and patent-pending solutions, other forms of intellectual property and documented know-how - can be maintained in centralized knowledge warehouse of organization, enabling a variety of different views of the content. It can be thought of as “information repository” of innovation assets of the organization.

The biggest chunk of tacit knowledge of an organization is know-how usually referred to as business practices. It likely appears in such places where the organization identifies strong variability in outcome and quality of the business processes executed by top or average performers. The remedy to the situation is to organize processes of extracting knowledge, putting them into learning context, and supporting transfer of skills and experience through learning and training the personnel.

3. Best Practice Learning – extracting and transferring tacit “know-how”

Best Practice Collaborative e-Learning is developed on the top of Knowledge Management and Organizational Learning disciplines. It enables companies to efficiently support extracting of tacit “know-how” from the heads of their best performers, storing them in the form of online questionnaires, and on top of that, learning personnel in such a way, that “they quickly begin to think like experts” (6).

In the meantime, e-Learning vendors list includes a number of technology developers such as Pensare, DigitalThink, Athenium, Communispace, Worklinks and others. Most of them provide a combination of software and services that enables large organizations to connect together innovation leaders (internal champions, best performers, external experts) and create unique environment for cross-company collaboration – through brainstorming, sharing best practices and experiences, survey each other, etc.

What makes e-Learning important for IAM, is the ability quickly to organize a process of managing tacit knowledge assets in the organization.

What makes questionnaire-based collaborative learning especially important is that the whole design/innovation process is (according to Eric Armstrong) “fundamentally one of questioning. Questions predominate in the process: Should we do that? If so, how? What impact does that have on the rest of design? -Does it make other things easier or harder?...And, in fact, the essence of creativity is answering self-imposed questions...”

4. TRIZ-IAM: support of efficient transformation of innovation assets and generation of new knowledge

Today, TRIZ is recognized as the most advanced and sophisticated methodology (8-10), which radically changes the approach inventors and engineers have been applying to inventive problem solving for a long time. TRIZ contributes significantly to both dimensions of "invention making": problem statement formulation and search for solutions.

TRIZ is undoubtedly the most powerful methodology supporting knowledge-intensive innovative processes. In general, we distinguish three large categories of knowledge related to TRIZ:

1. Theoretical and methodological background of system evolution, philosophy of inventive problem solving and generalized experience of many generations of inventors presented in form of heuristics defining the solution search strategy.
2. A number of techniques, which define the inventive process, including specific rules of problem solving.

3. Specific knowledge bases, which organize mapping between generic problems and generic inventive solutions represented in form of scientific or technological principles.

Our vision is that TRIZ-related tools have to be incorporated to Innovation Asset Management system on modular basis thus creating an integrated system which will bring (a) better understanding of how specific ideas are related to the triple “products – organization – markets,” (b) provide scientifically-based evaluation of technology-related innovation assets from various perspectives, and (c) help with transformation of existing assets thus fulfilling the tasks of asset improvement and converting know-how assets to the intellectual property.

We see the architecture of IAM to be scalable with respect to modules, which can contribute to the process of transformation of existing assets and creation of new assets. TRIZ can help with achieving two tasks:

1. Evaluation of existing assets (patents, or any other know-how which exists in non-protected form, such as ideas, concepts, drafts, etc.) on the basis of TRIZ laws and trends of system evolution. This will establish a comparative qualitative measure for relative evaluation and ranking of the existing assets.

2. Improvement of existing assets by making them dynamically evolve via using TRIZ techniques and tools for technology improvement. New assets can be stored and managed in a usual way.

There is a wide range of software tools available which support TRIZ-based problem solving and new concept generation processes (TechOptimizer™, Innovation Workbench™, TRISOLVER™, CreaTRIZ™), as well tools which are not directly related to TRIZ but incorporate some TRIZ principles and integrate with modern IT Methods (CoBrain™, Knowledgist™). However, most if not all of mentioned products are targeted at the specific problem solving process and do not involve managing information around the problem and solution. In other words, they do not support the process of management of innovation assets produced with these tools (which can only be considered as a disadvantage within the context of the whole innovation cycle).

Some other disadvantage of these tools is that they produce results, which vary from very vaguely defined ideas and concepts (e.g. physical principles) to pointing to specific technologies, which are not clear how to adapt to a specific situation. Therefore, newly generated knowledge cannot be quickly put to practice. As a result, other means are required to transform these ideas and concepts to intellectual property that would bring measurable value to an organization.

Although we do not target at eliminating this disadvantage by creation of a completely automated system which will generate patentable solutions on the basis of given problems (which is not possible at the moment due to the lack of theoretical foundations), we believe that managing problems and solutions within the context of IAM will add considerable clarity to the innovation management processes established by an organization.

The above mentioned not means that completely new TRIZ software tools must be developed; in fact, we believe that already existing solutions from different vendors (for instance, TRIZ solution maps) can be used as parts of IAM solutions.

For example, as outlined in the review of experts from InnovationTRIZ (www.innovation-triz.com), they found the use of Problem Formulator – Diagramming tool within IWB software as “outstanding tool to analyze a patent disclosure or a competitive patent that is blocking a competitive action.”

In turn, modern Knowledge Management system are not limited to only managing (capturing, storing, organizing and retrieval) of information and knowledge. They also support the process of knowledge transformation. In some cases, transformation of a knowledge asset results in generation of a totally new knowledge, which becomes either a single asset or a new set of assets.
For example, one of the important modules is based on approaches to technology or engineering system forecast developed in TRIZ (11-13). The idea is to build quickly a forecast of technology trends that may affect the existing system (component, part of the product or service) or technology in the future and to build estimation of importance of the innovation asset for the coming 1-3-5 years.

The outcome of this phase is to identify mission-critical components and identify potential R&D projects which results may better save or protect value of the company.

5. Innovation Asset Management Framework

To address the above-mentioned challenges we have initiated the development of a framework for Innovation Asset Management. Being constructed on the top of knowledge management IAM should cover the following (7):

- Identifying what knowledge assets a company possesses:
  - Where is the knowledge asset?
  - What does it contain?
  - What is its use?
  - What form is it in?
  - How accessible is it?

- Analysis how the knowledge can add value:
  - What are the opportunities for using the knowledge asset?
  - What would be the effect of its use?
  - What are the current obstacles to its use?
  - What would be its increased value to the company?

- Specifying what actions are necessary to achieve better usability & added value:
  - How to plan the actions to use the knowledge asset?
  - How to enact actions?
  - How to monitor actions?

- Reviewing the use of the knowledge to ensure added value:
  - Did the use of it produce the desired added value?
  - How can the knowledge asset be maintained for this use?
  - Did the use create new opportunities?

In its initial incarnation, the IAM framework comprises five key innovation asset management activities, each of which could potentially be supported by existing or newly developed tools and technologies.
These key activities are described below.

**Identification** – Considering that a company has patents, other intellectual property and other know-how, we start from identifying innovation assets, which are in use, possessing or are generated by the businesses within the company. Next, we come up with classification of innovation assets and with establishing and analysis of their relationship with customer-oriented products/services; with internal processes, tools and technologies within the company; and even how these assets are related to each other.

**Preserving assets** – A set of operations on the top of repository, which include storing and updating asset descriptions, check-in/check-out operations, version management.

**Assessment** – It is important to outline impact of particular assets or asset portfolios on corporate goals, to identify gaps in asset portfolios that needed to be addresses. Comparison with competitor’s intellectual assets is welcome. Prioritization of the assets is also a part of asset assessment.

**Transformation & Utilization** – Generating innovation knowledge is vital if an organization wants to remain competitive. As we mentioned above, present technologies have fallen short of providing any significant impact on innovation knowledge creation. Computer-aided innovation (CAI) tools based on exploring TRIZ and similar approaches are key enablers for the tasks of transformation of innovation assets and generating new patent-level solutions.

**Tacit Knowledge Extracting & Transfer** – Organization of processes of extracting and transfer know-how which currently exists in form of tacit knowledge within the organization, or, in other words, what is in people’s heads, is important condition for successful innovation asset management. Support of collaborative tools and creating distributed learning context around extracted knowledge is vital for organizational success. Questionnaire-based best practice improvement methods and tools and applications that support them look most promising for the goals and needs of IAM.

6. Components of Innovation Asset Management Framework: IT system

Clear differentiation of innovation assets partly classified as explicit knowledge assets and partly as tacit knowledge assets has major impact on architecture of IT system supporting innovation
Innovation Asset Management: A New Dimension For Enterprise Strategy

The role of innovation asset warehouse in that framework is to keep explicit knowledge related to innovation assets and context in which they are used or applied. The solution lies in the development of a knowledge warehouse. A knowledge warehouse can be thought of as an “information repository” in which individual knowledge assets are catalogued and shared. Knowledge warehouse parallels the ideas of data warehousing. A knowledge warehouse enables different views on the knowledge assets and supports ad-hoc queries.

The role of competence transfer repository is how to provide a medium for collaborative, distributed learning and organize transfer of skills and competencies from the best performers to average performers. The most promising tools and technologies to support this activity are based on questionnaire model of knowledge acquisition and questionnaire-based learning. Each questionnaire, developed around “know-how”, is considered as a kind of innovation asset of the enterprise.

To meet the requirements of supporting and accelerating processes of creating new knowledge on the top of the whole system we suggest use of TRIZ-based CAI tools and methodologies. The open question which still remains is to provide interoperability between elements of the IAM system. Unlikely to imagine, that all the components can be provided from a single supplier. Hopefully, a considerable amount of the world software resources have been focused over past years around development of the Web (infrastructure, protocols, services) and for the Web (applications exploring Web). XML, SOAP, Web services are the recent examples of initiatives aimed at creating application capable to interoperate with each other.

Figure 3: Innovation Asset Management Framework
7. Innovation Asset Warehouse

Innovation asset is the most important knowledge in our warehouse. Each innovation asset can be defined in detail through its attributes. Since various organizations may have slightly different needs in handling innovation assets, the attribute list for an asset may be different as well.

Innovation assets are described through natural language statements. So far, they can be incomplete and ambiguous. To reach uniformity we need a glossary.

It is a requirement to support formal classification structure for the innovation assets. The assets can be classified by a type of knowledge they belong to – which is either tacit or explicit. They also can be categorized as intellectual assets or other tangible assets (know-how). The assets can be simple, complex, or even compound, i.e., include other innovation assets as components.

Let us define the components of the warehouse below.

**Business functions, processes and products**

When describing innovation asset it is important to understand which business it belongs to. It is also important to clarify in which products, systems, services or processes these knowledge assets are used.

Important knowledge about these things include:

- Business organization and definition which business unit is responsible for the given asset(s).
- Product characteristics.
- Product component model.
- Functional equivalence between products/services.
- Constraints and limitations (compatibility rules, energy consumption – are few of them).
- Other design knowledge (functional & physical breakdown structures).

**Knowledge about context**

Important knowledge of this level includes:

- Competitors.
- Strategic goals.
- Competitor's patents which block competition.
- Common standards, safety constraints.
- Environment protection, ecological constraints.
- Others.

**Knowledge about innovation assets**

It is important to understand what are the best innovation assets of enterprise and prioritize them; to define how they relate to each other; to understand how and where they are used; to identify gaps in innovations assets of the company.

Therefore, this knowledge become crucial:

- Knowledge on relationships between assets and products.
- Knowledge on interdependencies between various innovation assets.
- Knowledge on current context, past, and future.
- Others.
8. Relationship Matrix – Outlining a role of innovation asset

This simple technique is derived from QFD (14), and demonstrates how quite simple tools and techniques can help evaluate the role of particular assets with respect to products, services, or processes where these assets are typically used.

Imagine, that at the left side of the matrix we present assets grouped by business functions they belong to – a hierarchical WHATS list. At the top we put the hierarchical WHERE list which is either product, service or process taxonomy.

The values in the cells of the matrix are used to characterize importance of particular asset (patent, know-how, etc) with respect to particular element (any level) of the WHERE list.

{Strong-Moderate-Weak} or any other scale may be used. In addition, each component of the system/product may be characterized by its weight factor – which outlines “relative” importance of components in the whole product or service structure.
9. TRIZ System Operator – Simple Assessment tool

Another simple technique introduced in here for illustrative purposes is so-called *TRIZ System Operator* (originally defined by G. Altshuller), requires consideration of a context in which a particular system is used (components on the bottom level, environment or super-system on the top level). It also prompts the users to consider a time factor - description of state of system, super-system and subsystem and/or components in the past; current state, and future developments (which represents vision of a modeler).

Interested readers can refer to (15) for more detail description of what is TRIZ system operator and how it can be used.

With respect to IAM this instrument can be used for preliminary evaluation or assessment of innovation assets. The required context automatically appears by selecting particular view(s) on the asset or group of assets: this function is automatically supported in warehouse models. The forecast for a selected innovation asset (e.g., will use, disappear, will be valuable, not valuable, etc) is driven from forecast of evolution of the context environment in which we consider this particular asset.

10. Conclusions and Future Work

This paper represents Innovation Asset Management Framework in its initial incarnation. In special, we focus on three main centers of activities around framework: extracting and managing explicit level knowledge assets; extracting and transfer of tacit knowledge; TRIZ-based computer-aid innovation.

Future work includes more detail analysis of existing tools and technologies of collaborative learning, CAI tools and technologies exploring TRIZ, and further elaboration of requirements and architecture of information system, which supports IAM framework.
References


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