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Agile Innovation Management

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Abstract: The volume and velocity of innovations are on the increase resulting in increased pressures on every company for attaining, retaining and increasing its market leadership. Many companies need to retool their innovation management processes to address two agility related objectives in order to survive and grow in such a rapidly changing innovation environment. The first objective would be the ability to assemble an innovation team within the shortest possible time. This can only be satisfied by companies that are capable of forming innovation teams rather quickly. The related second objective would be to reduce the I2M (Idea to Market) cycle time to rapidly convert innovation opportunities into product and service innovations and deliver them into the market place before the competition. It is important for companies to benchmark their innovation management processes with respect to these two objectives. This paper reports indexes that companies can use to measure their innovation agility.

Keywords: Innovation Management; Benchmarking; Indexes; Agility

1 Background

A number of companies are not well prepared to manage the competitive pressures introduced by the rate at which innovations are being introduced into this world. Many of them do not have robust innovation management processes that are essential for handling such competitive pressures.

Competitive pressures due to the rapid rise in the volume and velocity of innovations require firms to retool their innovation management processes to address two different agility related objectives. The first objective would be to improve its ability to assemble an innovation team within the shortest possible time. Such an objective can only be satisfied by companies that are capable of forming innovation teams at short notice. The related second objective is to reduce the I2M (Idea to Market) cycle time. An efficient and shorter I2M cycle time reduction would prepare a company to rapidly convert and deliver innovation opportunities to the markets of interest well before its competition. It is therefore important for companies to benchmark their innovation management processes to assess their agility to respond to the increased rate of innovations and resulting market pressures.

A number of innovation metrics have been developed for benchmarking nations and firms [Adams et al, Chiesa and Coughlan, Clayton et al, Crepon and Mairesse, Hauser

and Zettelmeyer, Meiresse and Mohnen, Turrell, and Wong]. According to a study undertaken for the America's 21st century National Innovation Initiative, the benchmarking of innovation appears to have evolved through four generations [National Innovation Initiative, Milbergs and Vonotas]. The first generation focused on input measures, the second generation focused on output measures, the third generation focused on innovation indicators and the fourth generation focuses on innovation process indicators as shown in Table 1.

Table 1 The four generations of innovation metrics

1st Generation Input Indicators (1950s-60s)	*2nd Generation Output Indicators (1970s-80s)*	*3rd Generation Innovation Indicators (1990s)*	*4th Generation Process Indicators (2000s)*
R&D expenditure	Patents	Innovation surveys	Knowledge
S&T personnel	Bibliometrics	Indexing	Intangibles
Capital	Products	Benchmarking	Networks
Tech intensity	Quality change	Human resources	Demand
		ICT indicators	Clusters
			Management techniques
			Risk/return
			System dynamics

There have been several papers addressing firm level innovation metrics. A number of them derive their parameters from the first two generations of innovation metrics. Perhaps a few of them consider some of the elements of the third generation of innovation metrics. A study of the innovation metrics show that firm level innovation metrics fall broadly into two categories – accounting oriented or systems oriented.

We do not know of any innovation metrics that have really accounted for agility as an important dimension. Not many firms realize the need for building agility into their innovation management processes. Many firms have centralized innovation centres, while some have graduated to firm wide innovation and yet others have embraced open innovation in some form to expand the innovation capacity of a firm. While this is a good beginning, an open innovation process by itself does not address agile management of innovations. A company has to architect its ability to rapidly aggregate all its internal and external resources in order to define and dominate emerging new innovation opportunities in the shortest possible time in order to implement agility in its innovation management.

Section 2 introduces the research question and defines the methodology for Agile Innovation Management. This methodology addresses the earlier defined two objectives that are deemed to be important for implanting an Agile Innovation Management in a company. This section defines an index for each of the two objectives. Section 3 presents two different usages for the indexes to measure the innovation management agility of a company. The contributions of this paper and conclusions are discussed in Section 4.

2 Research question and methodology for benchmarking Innovation agility

We address the research question and the benchmarking methodology in this section of the paper.

2.1 Research question

The research question addressed in this paper is "How can a company determine how agile it is in introducing innovations to the market based on its current innovation management process?" This should be a measure represented in units of time. The unit of time will vary depending on the industry verticals in which a company's products and services are offered. In some industry verticals the unit of time may be represented in weeks while in some other industry verticals the unit of time may be represented in years.

2.2 Method for determining a company's agility in innovation

We had earlier listed two key objectives that a company should address in order to improve its innovation agility. These are:

1. The time taken to form an innovation team
2. Minimizing the Idea to Market cycle time (I2M)

We will label the first objective as Innovation Response Index (IRI) and the second objective as Agile Innovation Development Index (AIDI). The IRI is a measure of how fast a team can be assembled to design and deliver an innovation. The AIDI is a measure of how long it takes for an innovation team to develop and deliver an innovation. We will discuss each of these indices in some detail below.

2.2.1 Innovation Response Index (IRI)

Innovation response Index will be a function of two key characteristics of a company – Innovation Culture and Innovation Depth. Innovation Culture will be determined by the breadth of innovation awareness and practice in a company while Innovation Depth will capture the number of people who have innovation development experience process in general and a specific type of product or service innovation in particular.

2.2.1.1 Innovation Culture Index (ICI)

Innovation Culture Index of a company can be defined using the parameters listed in Table 2.

We now introduce three sub-indexes - Innovation Training effectiveness (ITE), Innovation Quality and Capacity (IQC) and Management Commitment to Innovation (MCI). ITE is an indicator of the quality of innovation training offered to the employees in a company. IQC is an indicator of the capacity and quality of the innovation proposals. MCI is an indicator of the company's management's commitment to innovation. We define the three sub-indexes below.

ITE = PESIP ÷ PEI, maximum value of ITE will be 1

IQC = PIPA * NIPPA, maximum value of IQC will be the same as the value of NIPPA

MCI = (((PEI + WIE) ÷ 2) + (PMI + WIM) ÷ 2)) ÷ 2, maximum value of MCI will be 1.

Table 2 Parameters used for deriving the Innovation Culture Index

Symbol	*Representing*	*Remarks*
PEI	Percentage of employees trained in innovation methodologies	The more employees trained the better the likelihood of a pervasive innovation culture. PEI will have a value between 0 and 1.
PMI	Percentage of managers trained in innovation management	The more managers trained the better will be the innovation management process. PMI will have a value between 0 and 1.
NIPPA	Number of innovation proposals per employee received in any year	Higher number of innovation proposals per employee is a good indicator of the innovation intensity of the company. PMI will have an integer value.
PESIP	Percentage of employees submitting innovation proposals	Higher the percentage of employees submitting innovation proposals the more widespread is the innovation culture in the company. PESIP will have a value between 0 and 1.
PIPA	Percentage of innovation proposals accepted for *development*	A higher percentage of innovation proposals accepted is an indicator of the quality of innovation identification process. PIPA will have a value between 0 and 1.
WIE	Weight in percentage given to innovation in employees ' appraisals	Higher weight for innovation in appraisal is an indicator of the emphasis a company places on innovation. WIE will have a value between 0 and 1.
WIM	Weight in percentage given to innovation in managers' appraisals	WIM > WIE indicates that the managers are expected to drive innovations in that company. WIM will have a value between 0 and 1.

We are now ready to define ICI

ICI = ITE*IQC*MCI, thus the maximum value of ICI will be the same as NIPPA

Example

Let us now compare two companies with different sets of values for the Innovation Culture parameters by calculating their ICI values as shown below in Table 3.

Table 3 Comparison of ICI values of two companies

ICI Parameters	*Company A*	*Company B*
PEI	0.20	0.40
PMI	0.50	0.40
NIPPA	4	2
PESIP	0.12	0.15
PIPA	0.5	0.6
WIE	0.2	0.3
WIM	0.4	0.5
ICI	**0.39**	**0.18**

The values of ICI for the two companies were derived using the definition of ICI. In this case, the values of ICI indicate that company A has a better innovation culture than company B.

2.2.1.2 Innovation Depth Index (IDI)

Innovation Depth Index can be defined using the parameters listed in Table 4.

Table 4 Parameters used in deriving Innovation Depth Index

Symbol	*Representing*	*Remarks*
PNO	Target percentage of new products, services and processes to be introduced in any given year	Higher the percentage, deeper the innovation practices. PNO will have a value between 0 and 1.
PEID	Percentage of employees involved in innovation development	Indicates the importance given to innovation by the company. PEID will have a value between 0 and 1.
NESI	Average number of employees with specific (same) innovation development experience	More employees working on the same innovation development the easier it is to reassign one or more of them to a similar innovation development effort. NESI will have an integer value.
LOH	Levels of hierarchy in the organization	The fewer the levels of hierarchy the easier it would be constitute cross functional teams. LOH will have an integer value equal to or greater than 1.
OMM	Organization's management model	Matrix type of structure allows easy assignment of employees belonging to a functional group to a project group.

	Strictly hierarchical management model will normally be a delay factor in quick assembly of cross-functional teams. OMM will take on a value between 0 and 1. A pure Matrix model will get a value of 1 and a very deep hierarchical management model will have a value closer to 0 and others a value in between.

We are now ready to define IDI

IDI = (PNO*PEID*NESI*OMM) ÷ LOH

Example

Let us now compare two companies with different sets of values for the Innovation Depth parameters by calculating their IDI values as shown below in Table 5.

Table 5 Comparison of IDI values of two companies

IDI Parameters	***Company A***	***Company B***
PNO	0.15	0.25
PEID	0.20	0.40
NESI	3	6
LOH	5	3
OMM	0.2	0.6
IDI	**0.0036**	**0.12**

The values in Table 5 were deliberately selected to deliver a message that a company's good ICI score does not necessarily guarantee good IDI score.

We use the definitions of IDI and ICI to define IRI as shown below.

IRI = ICI * IDI

The IRI for company A will be 0. 001404 and for company B will be 0.0216. Given that IRI is defined to be a product of ICI and IDI it will be very important that companies try to refine their processes to get balanced values for both ICI and IDI. Notice that IRI does not represent the time taken assemble an innovation team, it is rather a score to reflect a company's ability to assemble an innovation team at short notice.

IRI will have a value that is a number without any units of measure. A higher value of IRI will represent a higher / better state of readiness of a company to respond to innovation opportunities.

2.3. Agile Innovation Development Index (AIDI)

The value derived by a company from an innovation can be significantly affected by the time it takes to get a promising idea into the market. We use AIDI to measure the agility of I2M process in a company. AIDI is derived from the time required for fine grained activities..

Table 6 Times used in calculating AIDI

Symbol	***Representing***
TIA	Average time taken for identifying a promising innovation
TSGI	Average time taken to generate specifications for the innovation
TDI	Average time taken to design an innovation
TID	Average time taken to develop an innovation
TMI	Average time taken to market an innovation
TSI	Average time taken to scale an innovation across all desired markets

The above listed temporal parameters are defined below.

- TIA = Average time of ideation cycle in the company + Average time taken to select promising ideas + Average time required to assemble an innovation team
- TSGI = Average time taken to prepare an innovation proposal and budget + Average time taken to approve an innovation proposal and budget + Average time taken to form and validate innovation specifications
- TDI = Average time taken to design an innovation
- TID = Average time taken to develop an innovation + Average time taken to alpha test an innovation + Average time taken to beta test or pilot test an innovation + Average time taken to get a business unit acceptance sign off for an innovation
- TMI = Average time taken to get the advertisement plan for an innovation + Average time taken to design a brand architecture for an innovation + Average time taken to launch an innovation from business unit acceptance to sales
- TSI = Average time taken to introduce an innovation in the second market + Average time taken to introduce the innovation in other markets

AIDI will be a function of TIA, TSGI, TDI, TID, TMI and TSI. Some of the activities offer the potential to be carried out in parallel. For example, TMI related activities can be carried out in parallel with activities related to TID.

TDI and TID can also overlap if one uses Rapid Innovation Development (iterative development) method. In such a case the combined time for these two activities could be less than the sum of the average times taken for these two activities. We will use TDID to represent the combined time taken for TDI and TID whether carried our using waterfall sequential process or a rapid innovation development process.

AIDI = TIA + TSGI + max {TDID, (TMI + TSI)}

AIDI's units of measurement will be time. The granularity of the unit of time will depend on the nature of innovation development and may range from a week to few years.

A lower value of AIDI is desirable since it allows a company to identify, develop, test and deliver an innovation to market in a shorter time.

2.3. Agile Innovation Management Index

A company can use the values of IRI and AIDI to obtain an overall index that is representative of its agility in its innovation management process. We define Agile Innovation Management Index (AIMI) using IRI and AIDI as shown below.

AIMI = (IRI /AIDI) * K, where is a constant

The raw AIMI score could be a very small fraction. It would therefore be useful to choose a value of K to normalize AIMI's value to be between 1 and 100. This is merely an effort to present a number on a scale that can be easily related.

3 Uses of AIMI, IRI and AIDI

Every company should monitor its AIMI, IRI and AIDI on a regular basis, perhaps year on year to assess its Innovation Readiness and Agility in Innovation Development. A company can improve its agility in innovation management process by increasing the value of IRI and reducing the value of AIDI. This will be a general first step for the use of IRI and AIDI.

A company can take the proactive step of sharing the values of their IRI and AIDI indices with a neutral third party with the view to get the average values of IRI and AIDI for comparable companies in the same industry. The neutral third party can then benchmark all the participating companies in each industry and class, i.e. start-ups, SMEs and large enterprises organized by industry verticals. Such sharing and learning will allow every company to measure how well it is performing relative to others in its industry and class. This will be the second use of IRI and AIDI.

We are working with a Singapore company that gives out an annual innovation award for companies headquartered in Asia Pacific region. This company is working with a consultant to reach out to more than four thousand companies. The consultant is using

some of the concepts listed in this paper to survey and shortlist companies that ought to be considered for the innovation award. The companies will be shortlisted sometime in November and the award would eventually be given out in the first quarter of 2012. The survey is also expected to produce innovation related benchmarks for different industry verticals across different classes of companies. The year on year studies using the measures described in this paper could lead to gaining interesting insights into emerging innovation patterns both within an industry as well as across industries.

4 Contributions of the proposed method and summary

Agility as a critical component of a company's innovation management process is a relatively new consideration arising due the shortening innovation development and delivery cycles and the volume and velocity of new innovation reaching the markets.

The proposed method allows a company to measure its agility to respond to the competitive pressures experienced due to the much rapid pace of innovations getting to the market. The pace of innovation has in turn reduced the innovation cycle time in many industries thus requiring companies to re-examine their innovation management processes.

The work reported in this paper extends the current understanding and research in benchmarking a company's innovation management processes by defining one composite index and two component indexes. The method offers a company a means to regularly monitor and improve its innovation agility. The innovation survey that uses some of the concepts proposed in this paper is expected to come up with benchmarks for different industry sectors. Such benchmarks will allow companies to compare themselves with their peers in the industry and reengineer their innovation management processes for improving their innovation agility.

We foresee refining this method. One of the possible refinements would be to modify IRI to be measured in time units. This might allow IRI and AIDI to be added to produce AIMI rather than be multiplied as it is done now. This would eliminate the need to use a constant for normalization. There are bound to be other refinements and we consider this only as a beginning.

References and Notes

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