

Innovation Stack – Choosing Innovations for Commercialization

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Abstract--This paper describes a method for enterprises to order the innovations of interest according to a number of parameters including their own business strategy and core competencies. The method takes into account aspects such as ability to create entry barriers and complementary assets. Enterprises can now use this method to both filter out innovations that may not be of interest to them and then order the short listed or selected innovations according to their attractiveness.

I. INTRODUCTION

A number of authors have addressed different approaches to innovation [1, 2, 3, 4, 7, and 8]. A recent framework for innovation, titled Innovation Cube identified the key drivers, triggers and enablers of successful innovations [5]. This framework identified pain and pleasure as the drivers, technology and market shifts as the triggers and price point and market dominance as the enablers of successful innovations. This was followed by Innovation Engine, an algorithm for generating innovations [6]. Innovation Cube defined a framework while Innovation Engine provided a methodology for identifying new innovation opportunities based on the framework. The third link in this called the Innovation Stack rank orders innovation opportunities in the context of relevance to an organization.

A product or division manager in an organization is often confronted with several innovation opportunities. The manager has to then decide the order in which the different innovations could be addressed. A number of factors such as impact, resources and time to market will contribute to making such a decision. Innovation Stack is an imaginary stack which orders potential innovation opportunities such that the most promising innovation relevant to an organization will be placed on the top of the stack, the next most promising placed second and the least promising and still relevant innovation the last.

This paper presents the Innovation Stack methodology. Section II defines Innovation Attractiveness Parameters used in the ranking methodology. Section III discusses the relative sensitivities of these parameters. A method for computing the innovation attractiveness scores is presented in section IV. A method for rank ordering the different innovations is presented in section V. Section VI provides a summary on Innovation Stack.

II. INNOVATION ATTRACTIVENESS PARAMETERS

Innovation Attractiveness Parameters (IAPs) are used to define how attractive an innovation opportunity is to a

company. The following is an alphabetical list of innovation attractiveness parameters used in the Innovation Stack.

- A. Ability to create Entry Barriers (AEB): An innovation that is not easy to replicate or is able to erect any form of significant entry barrier is to be preferred over those that offer lower entry barriers to the competition. A score ranging from 0 to ∞ is assigned for this parameter. A score of 0 would imply that this innovation is easy to copy and / or cannot erect any form of entry barrier to prevent the competition from moving into the new market rather quickly. A score of ∞ indicates that this is not an easy to copy innovation and / or that extremely high entry barriers can be erected. Innovations with different degree of difficulties will take on score between 1 and ∞ .
- B. Alignment with Business Strategy (ABS): While there may be many attractive innovations, it is important to check whether an innovation is aligned with the business strategy of the company. For example, a company producing automobiles should really not have to worry about innovation opportunities in pharmaceuticals. The alignment of an innovation with business strategy is scored between 0 and 1. A score of 0 would imply that the innovation is orthogonal to the company's business and a score of 1 would mean that it is perfectly aligned with the company's business strategy.
- C. Alignment with Core Competencies (ACC): An innovation may be aligned with the business strategy of a company and might also offer robust entry barriers to competition but if the company does not have the requisite core competencies to develop and market the innovation then the chances of commercializing the innovation are pretty low. So, it is best to assess the alignment of core competencies of a company with the innovation opportunity on a scale of 0 to 1, 0 representing total misalignment and 1 representing total alignment. Total alignment would indicate all the core competencies required for developing and marketing the product are available in-house.
- D. Assessment of easy availability of Complementary Assets (ACA): Often times an innovation is built using suitable infrastructure or components already available in the market. Let us discuss some examples. Availability of spectrum is important for one to conduct a business as a mobile phone operator. Availability of communication equipment and mobile handsets are also important before one can offer mobile phone service. Spectrum, communication equipment, and mobile handsets are all complementary assets for a company that would like to

introduce innovations in the mobile phone service market. The score for ACA should be 1 when the complementary assets are easily available and should be ∞ when the complementary assets are very closely held and protected by a competitor and hence such assets will not be available to the company. The score for ACA will take on a value between 1 and ∞ when the closely held assets can be licensed. The actual value will depend on the difficulty of negotiations and the premium required to obtain a license.

- E. Business Value Potential (BVP): While all the above parameters are important, every manager has to be convinced about the business value generation potential of an innovation. Innovations can help either reduce operating costs or can lead to generating new revenues. Innovations contributing to significant revenue growth ought to be preferred over those that save cost of operations. Of course within each of the two categories there is also the relative value that needs to be considered. For example, two different innovations that can bring in different amounts of additional revenue will appeal differently to a manager. The Business Value Potential will take on a score between 1 and ∞ . A score of 1 indicates minimal value and a score of ∞ will indicate that there is unlimited business potential realizable from the innovation. The score for BVP will lie between 1 and ∞ if the Business value potential is has some business value. The larger the number the larger the business value. It is very rare to have an innovation with the value of BVP equal to ∞ given that event patent and copyrights are limited by time. One could use a function involving the number of years of right to use and the margin for the product to derive the value of BVP.
- F. Cost of acquiring new competencies (CAN): A company without relevant competencies in-house may decide to acquire such competencies from the market place for innovations that offer significant business value potential. The cost of acquiring new competencies will range from 0 to ∞ . A value of 0 is assigned when such competencies are available freely and can be acquired easily. The value ∞ is assigned where it is extremely expensive or difficult to acquire the required competency. In reality, the value will lie somewhere in between.
- G. Cost of Intellectual Property (CIP): In some cases, the innovation might require licensing intellectual property from a suitable source. The cost of intellectual property may range from 0 to ∞ . The cost of intellectual property is 0 when it is freely available. It is ∞ when it is exclusively held, extremely difficult to reengineer and addresses a large market share. Once again actual value will lie in between for most innovations.
- H. Market readiness (MR): An important parameter to consider is market readiness. It is important for a manager to understand whether the market is ready to adopt an innovation. There are instances when market is craving for an innovation and in such cases the value will

be 1. Other innovations might require a market to be created. It is important to realize that the market is not ready. The lowest value for market readiness is 0 and indicates that the market will never be ready.

III. DISCUSSION ON RELATIVE SENSITIVITIES OF THE PARAMETERS

While one could introduce a number of parameters to determine and order relevance and attractiveness of an innovation, it is important to remember that not all the parameters might impact the selection and ordering strategy equally well.

The sensitivity of the parameters with respect to a market will be dependent on the business objectives of a company. This is a topic for elaboration in a separate paper and hence is not discussed here. An ordered list of IAPs is given below.

- A. Alignment with Business Strategy (ABS)
- B. Business Value Potential (BVP)
- C. Ability to create Entry Barriers (AEB)
- D. Market readiness (MR)
- E. Assessment of easy availability of Complementary Assets (ACA)
- F. Alignment with Core Competencies (ACC)
- G. Cost of Intellectual Property (CIP)
- H. Cost of acquiring new competencies (CAN)

A company can choose to assign different weights to each of the IAPs based on either actual or perceived importance to the commercialization of an innovation. Different companies will choose different weights depending on their perception of importance of the parameters in their context. Therein lies an important aspect of innovation management.

Weights for all the eight IAPs will be assumed to be same for the purpose of this paper. If they are same, then without any loss of generality we can assign a value of 1 to all of them.

IV. COMPUTING INNOVATION ATTRACTIVENESS SCORES

Innovation Attractiveness Score (IAS) is used to determine the relative levels of attractiveness offered by different innovations. Let us consider 'n' innovations competing for investments.

The Innovation Attractiveness Score for i^{th} IAP is then a function of the eight IAPS and their weights. A sample function is given below. One can derive more than one function by using different combinations of the innovation attractiveness parameters.

$$IAS_i = (((W_{BVP} * BVP_i * W_{ABS} * ABS_i * W_{ACA} * ACA_i * W_{ACC} * ACC_i) - ((W_{CAN} * CAN_i) + (W_{CIP} * CIP_i))) * W_{AEB} * AEB_i * W_{MR} * MR_i), i = 1 \text{ to } n$$

..... (1)

It is important to understand the function presented above. Business Value Potential, Alignment with Business Strategy, easy access to complementary assets, and availability of Core Competence are all complementary parameters and reinforce each other. On the other hand, Cost of Acquiring New Competencies and Cost of Intellectual Properties work against attractiveness and hence are dealt separately as adding negative value to the score. While the combination of these two sets results in an intermediate score, it is the ability to erect entry barriers and the readiness of markets that determine the real attractiveness of an innovation.

The theoretical IAS values for any IAP using the above equation will span from $-\infty$ to $+\infty$. Actual values will lie across a much smaller range.

The above equation is only one possible means of combining the parameters and their weights to arrive at Innovation Attractiveness Scores for the different parameters.

Innovation Attractiveness Scores for two innovations such as MP3 player and a MRI machine for a consumer electronics company are shown in Table 1. Let us assume that the weights for all the parameters are all one. The values chosen are representative and actual values will require very detailed computations.

TABLE1: COMPUTATION OF INNOVATION ATTRACTIVENESS SCORES FOR TWO SAMPLE INNOVATIONS.

Parameters	MP3	MRI
BVP	15	30
ABS	1	0
ACA	1	0
ACC	10	20
CAN	100	60
CIP	0	200
AEB	50	500
MR	1	1
IAS	1350	-55,000

Clearly MP3 player as an innovation is attractive to this company in comparison to MRI innovation. Once again, these values are given as examples and not are not actual values.

V. ORDERING INNOVATIONS FOR ADOPTION

The ordering of innovations can be split into two steps. The first step is used to eliminate innovations that are not attractive at all and the second step is used to order innovations according to their desirability and match with an organization's execution capacity. These two steps are combined in the following algorithm.

Begin

Sort (i, IAS_i) such that the value of IAS in the j th place is higher than value of IAS_j in the $(j-1)$ th place.

Remove all (i, IAS_i) whose IAS_i value is below a predetermined threshold

End

Clearly all innovations with a negative value of IAS will be of no interest to a company. Thus, zero is the minimum threshold one could use to filter out the innovation of no interest. In practice very few companies will pursue innovations that do not result in significant gains. Exceptions are those innovations that might be pursued for strategic reasons such as the need to have a token market presence in a product line. In all other cases, the company should additionally decide a positive valued threshold that can be used to skim off less attractive innovations.

A company should focus on the innovation that is at the top of the sorted list. This would be the most attractive innovation for the department, division or the company. The next innovation on the sorted list would be next most attractive. One could go down the list till all the innovations are addressed or stop when the resources available for new product development is consumed.

MP3 player based innovation will be selected if we apply the above algorithm to the two examples. The MRI based innovation opportunity will not even be selected for consideration given its negative value.

The innovation stack could be used either at a department level, a divisional level or even at the corporate level. Corporate program offices could use the innovation stack as a methodology for deciding which innovations should be supported. In the case of submissions from multiple divisions, there may have to be a slight modification to the algorithm to bring in an element of equitable distribution of resources across multiple divisions.

Alternatively a company could take an options based approach when all the innovations proposed by a division are all really well below the list of innovations that can be supported. In such instances such a division can be funded a nominal sum of money to investigate how they could refine the proposed innovation to make it more compelling from a business perspective. Such an approach will ensure that the enthusiasm from any one division is not doused and will stimulate and encourage the division to consider much more meaningful innovations in the future.

VI. SUMMARY

This paper proposes a method called Innovation Stack to prioritize innovations for the purposes of funding and commercialization. The Innovation Stack completes the new innovation methodology that consists of Innovation Cube as a framework and Innovation Engine as a method for identifying possible innovations.

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REFERENCES

- [1] Cohen W.M., and Levinthal, D.A.; "A new perspective on learning and innovation", *Administrative Science Quarterly*, vol. 35, pp. 128-152, 1990.
- [2] Galbraith J. R.; "Designing the innovative organization," *Organizational Dynamics*, Winter, pp 3-24, 1982.
- [3] Kelly P, and Kranzberg, M.; (eds) *Technological innovation: A critical review of current knowledge*, San Francisco, CA: San Francisco Press, 1978.
- [4] Moore G.; *Inside the tornado: Marketing strategies from silicon valley's cutting edge*, Harper Business, 1995.
- [5] Narasimhalu, A. D., "Innovation Cube: Triggers, drivers and enablers of successful innovations", in papers presented at *Annual Conference of the International Society for Professional Innovation Management*, Porto, Portugal, June 2005.
- [6] Narasimhalu, A. D.; "Innovation Engine", in press, *Annual Conference of the International Society for Professional Innovation Management*, Warsaw, Poland, June 2007.
- [7] Rothwell R., and Zegveld W.; *Reindustrialization and Technology*, London: Longman, 1985.
- [8] Von Hippel, E.; Users as innovators. *Technology Review*, Vol. 80, No.3, pp. 30-34, 1978