

Midterm Critical Review

Towards innovation measurement in the software industry

"Necessity is the mother of invention, but creativity is the mother of innovation". Anonymous

ABSTRACT

Throughout the course of human history, mankind has faced the inevitable need to thrive and not just survive. This has resulted in significant inventions in many fields, ranging from transportation to agriculture to healthcare and space exploration. However, the bifurcation between 'invention' and 'innovation' wasn't clear, until the dawn of the 20th century, when the Industrial Age came into being. It was then that the need was realized to christen 'innovation' as a subject of its own right, and a formalized structure was required to analyze the same. Fundamentally, innovation has been built upon the following four questions:

1. What is?
2. What if?
3. What wows?
4. What works?

The physics of innovation requires a 'growth-based' mindset, and not a 'fixed' mindset. It requires understanding the customers' unarticulated needs, to enable one to stay competitive in a market replete with constant challenges. The only certainty in innovation is that fact that it is an uncertain domain, and analysis, prediction and rules which are considered as tools for innovation by well-established organizations, often work in a stable environment, and badly backfire in the face of innovation. Innovation does not mean creating something which is radically new, but can also mean bringing about a radical change in an existing process and proving its worth. To realise the true benefits of innovation, proper management is often necessitated. It is only if the above management can perceive variation as the mother of innovation, and not as the mother of waste, can innovation materialize in today's environment, wherein excellence in execution is a sought-after virtue and low variation in terms of execution processes is often preferred, to avoid the generation of waste. To this end, the following review tries to identify various aspects of innovation management in the software industry, and how they align or differ from the content in Modules 1-6. It has been prepared in accordance with the requirements of the Management of Innovation in Engineering course, offered by the University of Toronto, under Professor Armstrong. It tries to synthesize the content in the modules with the paper, and attempts to

analyze the weaknesses in the paper and how they could be accounted for by change in innovation management techniques.

SUMMARY

In the research paper *Towards innovation measurement in the software industry*, Edison et al. realize that it is critical for the software industry to continuously innovate, and that this requires a good understanding of the external and internal factors that govern the same. The need for an innovation measurement framework is suggested, and definitions, measurement practices and metrics proposed in literature and in practice are analyzed and evaluated. Systematic literature reviews, online questionnaires and interviews with practitioners and academics are utilized to garner information that can be used to formulate a comprehensive definition of innovation. The resulting conceptual model is further molded using feedback from focus groups.

ANALYSIS AND EVALUATION

The authors have used well defined criteria for inclusion/exclusion of literature in the course of studying innovation in software. Pilot data extraction has been performed and the viewpoints of different reviewers compared to make sure they had the same interpretation when it came to the data. Primary studies that were selected were grouped into five main categories based on their relevance to the concept of innovation. Interviews and online questionnaires have been used to gain insight into the following areas:

1. Impact of innovation.
2. Types of innovation.
3. Degree of novelty.
4. Nature of activities.
5. Nature of the innovation process.

The authors have done a great job in distilling various innovations frameworks and have chosen the technical audit framework by Chiesa et al. to be the most authoritative in terms of industry level validation. Their work on perception of innovation proves to be very insightful, as they showcase how the perception of innovation changes as one proceeds up the corporate ladder. Their studies on innovation frameworks show deficiencies in various areas, ranging from definition, metrics, guidelines, and the associated costs with innovation measurements. The identification of challenges causing these deficiencies have led to the creation of a generic innovation measurement model, that has been further refined with input from practitioners and academics, and whose performance is measured using the GQM (Goal Question Metric) measurement framework. Their work has been well received by user groups, with some even expressing interest in customizing their model for use with their existing process frameworks.

From Modules 1-6, we see that the authors have indeed touched upon the scope of innovation (described in Module 1) by taking into account the perceptions of various focus groups and amalgamating the types of innovation (*product, process, market* and *organisation*) along with the degree of novelty of innovation (*new to the firm/market/world/industry*). However, a possible flaw exists since the authors have not chosen to examine the philosophical aspects of innovation in the software industry. They fail to provide practical examples where the need for innovation is the greatest. With regards to the dimensions of innovation (described in Module 2), the authors have identified internal and external determinants of innovation. Customer orientation and inter-functional co-ordination are key to the success of innovation for SME's (*Small and Medium Enterprises*), and this requires constant changes in process structure, that cannot align with the objectives of larger organizations. Since the focus groups from the latter category chose commercialization and not value-creation as the prime driver for innovation, this represents a weakness in the generic innovation model that was developed. The life cycle of innovation was described in Module 3, and the authors have done a great job in analyzing the types of innovation and the various classes of adopters. However, they have not touched upon the corresponding timelines on the S-curve wherein these adopters come in to play their respective roles, nor have they analyzed how the differing perspectives impact one another and the final product. Module 4 discussed the benefits of having a vision statement, and on the horizontal and vertical integration of processes along functions and departments. While reviewing the data collected through interviews and online questionnaires, the authors have realized that the metrics used to measure success in the software industry greatly impact the need that people feel with respect to processes used to measure and streamline innovation initiatives. Many respondents were unaware of the existence of such frameworks in their organizations, and firmly believed that revenue generation, IPR and customer satisfaction were the prime goals of measuring innovation. Lack of empirical evidence of the benefits of lean processes such as six sigma seem to have forced the authors to tailor their innovation model to suit the viewpoint held by the software industry and make it GQM-compliant. The need for the right leadership and designation of clear roles and responsibilities is stressed upon in Module 5, and the preponderance of an innovation-based culture is essential in order to nourish it. The authors have verified the presence of such a culture in software based SME's, and believe that the same can be attributed due to the unequivocal nature of R& D which drives the latter. However, they do not seem to have attempted to find a solution which tries to align the differing viewpoints into one coherent framework that can be evaluated using the same metrics across various roles. Module 6 elucidates the primordial importance of a holistic approach to enterprise transformation and the assessment of the same on the enterprise as a whole. The proxies of innovation identified by the authors (as present in SME's) seem to have their own relative strengths and weaknesses, and do not appear to coalesce with one another, due to their focus on widely differing aspects of the software industry. The authors do their best in trying to incorporate all of these into their model, but have not managed to get quantitative feedback that proves that the model actually works in improving innovation in those organizations that chose to adopt it.

SYNTHESIS

The critical analysis conducted above reveals that the authors of the paper seem to have understood the gist of the problem related to the lack of innovation-based structures and metrics in software organizations. They attribute the disparity present in the definition of innovation to the emphasis placed by the latter on goal-based innovation rather than process-based innovation. The authors seem to have gathered this conclusion based on face-to-face interviews with few practitioners (in Sweden) and through online questionnaires addressed to people across the globe. Therefore, it seems as if the data gathered is not comprehensive enough, even though the authors have gone to great lengths to ensure the validity of the same. The quality of the model and the metrics used for assessment would be greatly enhanced if the authors could apply the general innovation management principles (described in Modules 1-6) to a specific case study and illustrate the benefits of the same quantitatively, in order to convince the reader of the effectiveness of the model.

CONCLUSION

Overall, the authors of the paper have done an excellent job in researching the causes for the lack of innovation frameworks and metrics in the software industry. They have tried their best to propose a suitable model while keeping in the mind the differences between the way the software industry views innovation in comparison to industries that are more '*factory-floor*' based. There exists the need to view variance as a driver for innovation, and that is something that is predominantly lacking in the proposed solutions. I believe that the paper is a great example at illustrating how innovation management principles can be used to analyze and develop process-based alternatives to improve productivity for goal-centric industries such as software.

REFERENCES

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