An Integrated Innovation Framework. How IBM(1990-2000) has Mastered the Innovation System

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Abstract. This paper develops an integrated framework to master the innovation system. Building on the innovation should be managed as a system; we tested this framework empirically by using IBM Case (1990-2000). One of our conclusions is: when innovation is undertaken as a system by using an integrated framework, even informally, it should help to regenerate the whole firm but there are some lessons to improve it.

Keywords: Innovation, Innovation model, Integrated Framework Innovation System, IBM

1. Introduction

Managers faced an increasingly changing business environment. Being innovative has become an obligation. Research and studies in innovation domain are very abundant and covered several aspects. Findings of these researches are not consistent and difficult to adapt to a specific situation [1]. The aim of this study is to develop an integrated framework of innovation system that could help executives comprehend, plan and asses innovation effort. To validate this framework we used the IBM (1990-2000) case study. Our approach is consistent with integrated view [2] joined with a systemic perspective [3].

The following section discusses the literature results review, followed by the methodology adopted explanation. The results emerged from the IBM case study will be discussed. The Integrated Framework Innovation System (IFIS) will be described and we will explain how this model will be used by managers. At the end we present future prospects and possibilities for our finding results improvement.

2. Literature Review

Technology-push model greatly simplified the innovation process. It includes the major stages of innovation process, but it doesn't take into account feedback loops from the costumer. Market-pull model as technology-push does not take into account feedback from technology research. Assuming that these models are complementary, any comprehensive innovation system model should take into account these complementarities. Other models explain the interactions within innovation system by emphasizing multidirectional knowledge flow [4]. Networks relationships between stakeholders are the key factor to bring about new paradigms.

3. Methodology.

Innovation models synthesis was conducted. We used a systemic approach [3] coupled with integrated view [2] to conceptualize the model. To test it empirically, we adopted the case study methodology [5], [6]. The data we used are of three types: (Official data from IBM during 1990 to 2000 period, such as annual reports; Interviews conducted with key persons in business at IBM; Interviews conducted with officials from IBM that were no longer active at IBM). These three kinds of data provide a description through multiple perspectives which will help the emergence of information relevant to the innovation system at IBM (1990-2000). Encoded information was used to document, argue or refine the model.

4. Model Conceptualization and the Role of Different Actors in the Innovation System

4.1. Model Conceptualization

Managers need to use research technology results to build on the available opportunities and to take into account consumer needs. Indeed it is not a model of technology-push or demand-Pull model alone but a feedback loop that includes the two models: **The implementation loop**. Frozen Paradigms should be surfaced and questioned continuously. Otherwise they would turn into obstacles to learning and new idea generation. An **opportunity creation loop** that integrates both aspects of paradigm development and paradigm shift could be conceptualized. The implementation loop and the creation loop should be integrated to feed each other (Fig. 1).
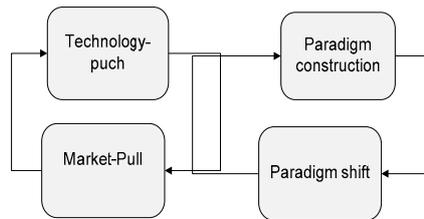

Fig .1: Systemic view of innovation: Implementation loop and creation loop.

Once these loops are designed, the next step is to identify the important components of each loop and how each loop components interrelate to each other.

5. The Role of Different Actors in the Innovation System

The integrated map[3] takes into account two main axes: The individual-collective axis and the internal-external axis. The combination of these two axes allows us four quadrants of an integrated map. Inspired by this integrated view, the innovation system could be mastered by adopting the four quadrants (Fig.2) corresponding to individual competencies and abilities (individual-Internal), assets of the company and its culture (Collective-Internal), new opportunities and technologies (external-individual) and economic sector in which the company operates and its paradigm (external-collective) (Fig.2). Combining the four quadrants for each loop: The implementation loop and the creation loop determinants of each loop could be conceptualized as follow:
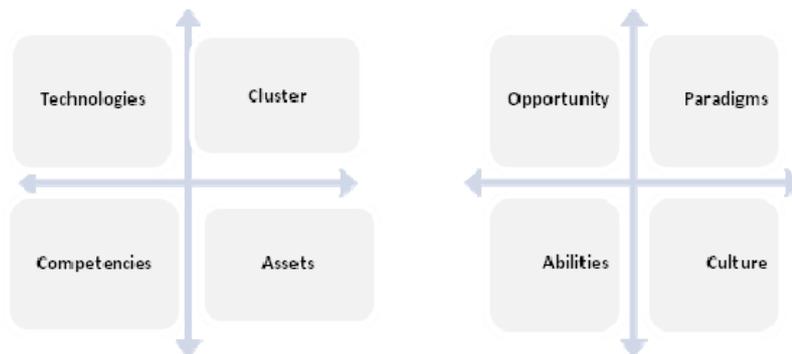

Fig.2 Integrated map of innovation system

According to this synthesis, eight constructs were elaborated to describe the structure of the innovation system. We added constructs related to interactivities between system components: The employee-costumer, the Costumer-company and the company-environment. These eleven constructs are described in **table 1.**

6. Testing the Model Empirically (IBM-1990-2000) Case

6.1. The Costumer'S Role and Opportunity Importance in the Innovation System

Customer need: What is the need to satisfy and what are the technologies available that we have to use to create value? Several technologies will be assembled to ensure the successful implementation of the idea. This idea was crystal clear in several IBM officials' declaration [7] '*We are the company that knows how to take the hardware, the software, the services, the consulting, the Linux capabilities… all the pieces and put them together and make it real for our customer'.*

Changing needs creates a tremendous opportunity for innovation [8]. What distinguishes IBM environment in the early 90s is the change of customer needs: Problems were related to the integration of several tools in a standard and integrated communication system to ensure exchange and interoperability*' Everywhere you look today business and institutions alike, you see the need for things like more speed to market, more flexibility and nimbleness, accelerated global expansion, and more customer and supplier integration'* [9]:. Any comprehensive innovation system management has to take into account how to anticipate customer needs as well as their changing.

Table. 1 : Constructs description

Construct	Description
Customer(Needs, Changing needs)	*(Needs to be satisfied and the available technologies, The emergence of new problems).*
Employee(Competencies, Abilities)	*(Employee's competencies to exploit the opportunity and master the technology, Employee's beliefs to be surfaced and questioned in order to get rid of all those limiting.)*
Firm (Assets, Culture)	*(The business model and processes are mastered to ensure the creation of value, Changing the prevailing culture that limits the emergence of new ideas)*
Business environment (Alliances, Paradigm)	*(Building alliances to ensure the availability of product components and the competencies the firm doesn't have, Paradigm and mindset shift should be initiated to exploit the full potential of the external business environment)*
Interactivities (Employee-Customer ,Consumer-Firm,Firme-Business environment	*(Learning Mechanisms for employees about new needs and their change, Institutionalized mechanisms for incentives and knowledge sharing, Interfaces to participate in new paradigm constructing).*

6.2. The Role of the Employee in the Innovation System

Employee's Competencies: Do employees have the competencies and skills required to develop, master and use the available technologies to create value? Without these competencies, David Grossman, a member of the IBM development team, could not have detect the opportunity offered by Internet when he was watching the data related to the 1994 Olympics released by Sun [10].

Employee's abilities: Employee's abilities are equally important as competencies. Have all employee's believes been surfaced and questioned? ' *If you don't occasionally exceed your formal authority, you are not pushing the envelope'*[10] . The same attitude has been highlighted in the IBM emerging opportunities plan (EBO).[11]: *'You need managers who like to explore and experiment and who challenge assumptions'.*

6.3. The Firm'S Role in the Innovation System

Firm's assets: Is the business model viable? Are manufacturing processes mastered to ensure the creation value for consumers? IBM assets have been a key question during 1990 to 2000. '*IBM has moved beyond a simple acknowledgement …. By enabling all of our storage products for Linux we gain prove our ability to translate industry leading technologies into open, standards-based solutions for customers'* [13].

Firm's culture: Was a change in the prevailing culture that limits the emergence of ideas within the organization initiated? Have procedures to encourage the creation of new ideas been institutionalized to exploit the full firm potential. Recognizing the value of creative work including what may be perceived as a failure is also important [12]. '*We are doing everything we can to focus everyone here on what's outside IBM_ markets, customers, competitors. We are increasing the speed of our decision-making and execution because in an industry changing so rapidly that a product's life cycle is now 9 to 12 months'*[16].

6.4. The Capacity to Influence Business Environment

Alliances: External factors are important to innovation system such as demanding customers, suppliers who anticipate the demand for production factors and the rivalry between competitors [14]. During (1996-1997) the IBM alliances were aimed to develop agreements in new expertise areas in order to explore new technological capabilities [17]. *'there have been three significant changes really. One was the PC in 1981, another was PCPIP (sp) and the Internet in 1991 and then in 1999, Linux has emerged. …: A venture capital was moved to these areas '*[16]. This statement denotes that IBM management was aware about influencing business environment.

Paradigm shift should be initiated to exploit the full potential of the external environment. Interactions between all existing partners and new ones should be intensified. These interactions help shift the dominant paradigm and participating actively in the building of new common ones. *'One of the great things about this industry is that every decade or so, you get a chance to redefine the playing field,…We're in that phase of redefinition right now,*[20].

7. Interactivity between Different Actors in the Innovation System

To master innovation system, not only the components must be taken into account but interactivities between different actors as well. In IBM case study, it emerges that the top management was aware about the **employee-customer** interactivity importance. *'you want to be where the action is, where the market place is most dynamic'*[19]. Teams were to shape the evolution of the market. They had to imagine customer experiences to help build a commitment for future IBM products [13].

The importance of interactivity of the **employee within IBM** was taken into account by changing incentives in order to boost and develop teamwork. Incentive systems have been modified so that the heads of business units are not rewarded solely on the performance of their unit, but on how they operate as a team and how they encourage entrepreneurship [13] *' You need to be a little bit of a battler, a little bit of a cajoler, a little bit of an entrepreneur. You really have to believe in this stuff—even when it's not completely clear— to inspire people in the company'*[20].

Bringing together a portfolio of organization is just the first step that must necessarily be completed by the implementation of the mechanisms that institutionalize the organizations network [17]. During the period (1996-1997) several partnerships have been forged by IBM in new expertise areas to explore new technological capabilities [18].

To sum up, it appears that from IBM (1990-2000) case study that *employee-customer*, *employee-firm* and *firm-environment* interactivities were taken into account and procedures to master these interactivities were undertaken. We conclude that these interactivities play an important role in Innovation system

8. Integrated Framework Innovation System

As a result of this study, we present an integrated framework of the innovation system (Fig. 4).

In the previous section we described the foundations components of the innovation system, by focusing on customer needs and their change. To use all their competencies potential, employees should develop their abilities. Moreover, the firm must have the necessary assets to exploit ideas and concepts into products. Doing so, the company should address its culture to not become an obstacle to the ideas generation. In a changing business environment, building alliances is a key factor because firm cannot afford to have all the assets and competencies. The systems approach requires the mastery of relations between all the actors. *Employee-customer* interactivity must be encouraged and institutionalized to clarify and monitor the customer's need in its change. The *interactivity of the employee within the firm* must be developed by mechanisms boosting new ideas into added value. The company must build alliances and partnerships to secure the necessary competencies and assets and intensify *its interactions with these partners* to participate in the norms, standards and paradigms building and get rid of obsolete ones.
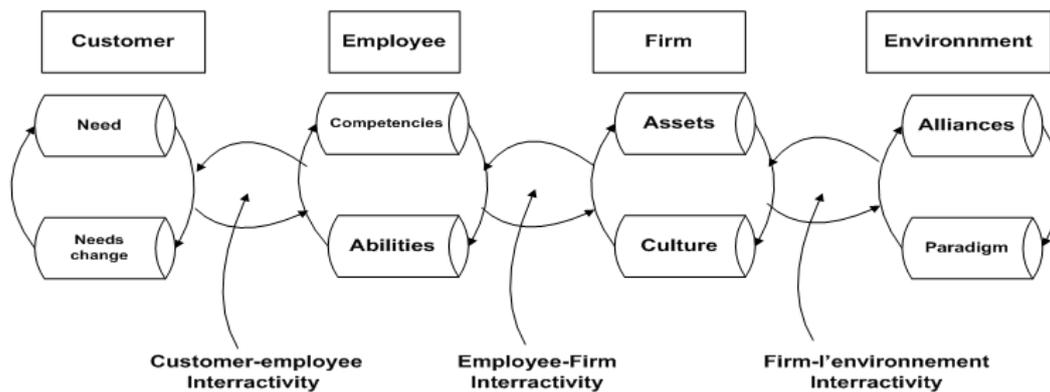
Fig.4 Integrated framework Innovation System

9. Conclusion

Managers are increasingly faced with fierce competition and scarce resources. They are asked to adequately use these resources .To achieve this goal, the availability of an Integrated Framework Innovation System (IFIS) is very helpful to levers detection. Based on systems approach and integrated map where all the main actors: the costumer, employee, firm, and sector, interact in an internal and external environment. Interactivities between different actors namely: the *employee-customer* interactivity*, employee-company* interactivity and *firm-environment* interactivity were highlighted. The adoption of this Framework could be the foundation structure of any approach to optimize diagnosis and monitor innovation system. The framework will allow the easy detection of potential levers on which managers could act to foster innovation depending on their context. Regarding future studies researchers, it would be interesting to aim to elaborate an innovation process mapping. It would be a great use to managers to master not only the innovation system structure but how innovation processes interact as well.

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