

Measuring innovation in the "Process" approach: the case of agro-food products in Morocco.

Fatimaezzahra Fouad*, Amina Tourabi**, Ghizlane Lakhnati***

, (Laboratory of Industrial and Computer Engineering, National school of applied sciences, Ibn zohr University, Morocco)

ABSTRACT

Today, innovation is an important pillar to effectively position in global markets. Nevertheless, produce a good completely new or significantly improved, requires reducing the gap between the intended purpose and the end result it either internally or externally of the firm.

This paper also proposes a measurement model based on the "process" approach. This proposal is based on a set of explanatory variables and explained linking internal and external effectiveness of innovative product.

Keywords – Food SME's, innovation process, measure indicators of innovation, Product innovation, Process approach.

I. INTRODUCTION

An abundant literature has accumulated on the theme of innovation, which is widely considered as the basis of a competitive economy. Selected empirical studies, focused primarily on direct analysis models seeking to explain the performance variables by internal and external factors of innovation, or based on a functional approach, also called "the approach of technological capabilities innovation "(CIT) which is usually measured in terms of its impact on innovation performance on the market.

Without denying that the two approaches provide pertinent responses to the measurement of innovation performance either through "Resources" approach or "Capacities" approach, there are other fields of analysis of the Innovation not yet intensively explored as "the innovation process."

The interest of this field is that the innovation process constitutes a serie of activities that can be either favorable or unfavorable to the innovation performance.

II. THEORETICAL BACKGROUND

1. The product innovation in Moroccan agribusiness SMEs

Our study is based on product innovation. This choice is due to the increased need for Moroccan Food Company to create value for its new products for export.

This value is usually represented by the achievement of a certain performance of a partially new product on the market.

In this sense, the Moroccan agribusiness SMEs occurs most often with a slightly innovative product that does not offer enough uniqueness relative to the

competition, hence the low competitiveness of the national product in foreign markets.

A study on the impact of product innovation on performance [1], the results showed that there is a U-shaped relationship between product innovation and most key measures profitability. This U-shaped generated the positive impact of highly innovative and less innovative products on performance.

Thus, according to the theory, incremental innovation could be very favorable for the commercial performance since less innovative products are more familiar, less uncertain, and may have increased synergies, and therefore have a higher success rate.

From the above, our work is based on an exploration of habits followed in product innovation in the food processing SMEs with a measure of the ability of such an innovation to generate profitability in the market.

2. The "Process" Approach :

In the theory of measuring innovation, there are three main approaches to measurement, namely the "Resource-Based View" approach, the "Capacities" and the "process" approach.

"The approach by resources helps explain how companies derive competitive advantage by channeling resources into the development of new products" [2]. These resources can be in the form of financial assets, human, physical, commercial, technological and organizational used by the firm to develop new products [3].

The approach "Capacities" in turn, helps explain how companies derive competitive advantages by improving a set of features that facilitate and support the technological innovation strategies.

These abilities come under several areas, namely: learning ability, R & D capacity, resource allocation

capability, manufacturing capacity, marketing capacity, organizational capacity, and capacity planning Strategic.

These measurement approaches have tried to make a clarification on the contribution of resources and capabilities to the performance of the external innovation. Mainly business performance.

What was missing in this sense was the consideration of a process that would address the main steps of a product innovation; and that would measure the performance of the internal innovation of the company before moving to the marketing stage.

Called "innovation process", this element is an intermediate part between what we would call "resources" or "innovation input indicators" and "output indicators of innovation".

In the audit process, had identified in this framework, a process broken down into seven sub-processes, namely: idea generation process, development process, the production process, the process of acquisition of technology, the process of leadership, the process of resource supplies, systems processes and tools [4].

The audit process tried through these sub-processes to improve the activities of innovation through a comparison of performance against objectives for innovation.

At this level, there is a second distinction of "innovation process", i.e. the "sequential process" and "partially parallel process".

The sequential process is the most common throughout the food industry. Except that in theory, it appears that in the parallel process, there are steps that can be done simultaneously and therefore there will be more chance of coordination between the different units of firm minimizing the possibility that R & D conceive difficult or expensive products to produce.

For this purpose, generally an innovation process coincides with the steps of, from upstream to downstream:

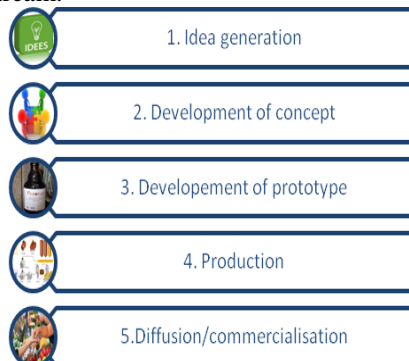


Figure-1: Innovation Process (source: proposed by the author)

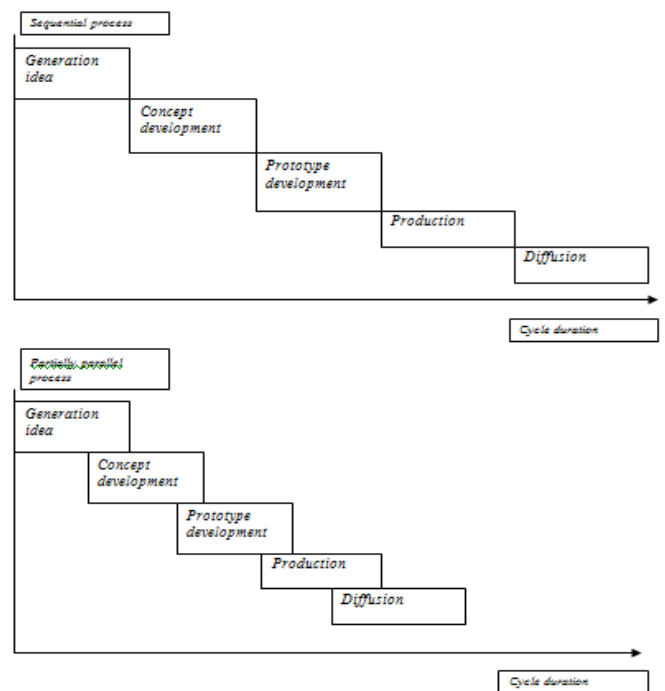


Figure-2: Sequential innovation process and partially parallel innovation process [5]

We thus see that the cycle time differs in each case. This observation reveals that the time devoted to new product development as well as the response to customer needs is shortened in the case of partially parallel process of innovation. Which may therefore be very favorable for the performance of the new product on the market. Nevertheless, this type of process as it may have advantages, it can also increase the risks and costs associated with development.

Hence our desire is to test the achievement of objectives set by internal for the new product based on the process approach on the one hand and on the other hand, to measure the impact of these objectives on product performance on the market by including the variable "type of the innovation process."

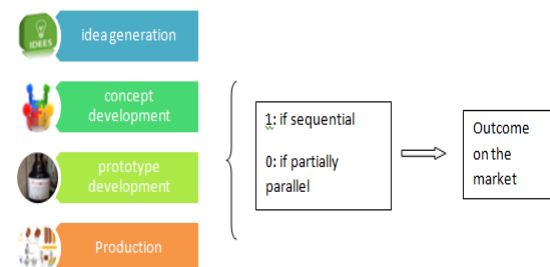


Figure-3: Proposed model for measuring product innovation in "process" approach (source: model proposed by the author)

We stopped at the production phase because in most companies with which we did interviews, do not have a marketing unit here in Morocco.

From there, we suggest that the method of "audit-process" is better positioned to address the problem of our research.

In this sense, our contribution lies in exploring the different features of the innovative product from three points:

- The nature of the innovative product,
- The expected goals of the innovative product at each stage of the innovation process,
- And the resources allocated for the realization of innovation activities.

The resources in our case are presented through factors positioning at the entrance of innovative activity and are expected to contribute to the implementation of the new product.

The innovation process is the intermediate part between the inputs of innovative activity and the output of innovative product on the market. It also reflects the expected objectives of the new product from idea to broadcast.

Given this, the process of innovation will play a double role:

- The internal effectiveness expressed by a set of objectives related to innovative product;
- And that of an internal effectiveness explaining the external effectiveness of the innovative product in the market referring to the type of the innovation process.

This distinction of roles leads us to propose the idea that the effectiveness of an innovative product internally could positively influence its effectiveness externally.

Therefore, we can expect a relationship between internal and external success [6].

Hence the general hypothesis of this work:

Hypothesis 1: The effectiveness of the innovative product in the innovation process will create effectiveness in the market.

Referring to the type of innovation process, we have:

Hypothesis 1a: The effectiveness of the innovative product in the innovation process will create its effectiveness in the market in the case on a sequential innovation process.

Hypothesis 1b: The effectiveness of the innovative product in the innovation process will create its effectiveness in the market in the case on a partially parallel innovation process.

III. The measurement of product innovation:

For several years, the food industry in Morocco was part of a trend towards loss of competitiveness not only in external markets but also in the domestic market. This was mainly due to a weakness of innovation characterized by very small changes in the initial product.

This is derived from several obstacles. Among them, there are the low qualification of human resources, financing problems particularly for SMEs, supply problems with raw materials, low capacity for cooperation with a business culture unfavorable to change, lack of research, the high cost of transportation, packaging and energy, etc.

On this occasion, we propose a model for analyzing these data at the level of SMEs across the indicators we will mention below.

1. The analysis model and the choice of indicators:

Based on the issues identified in the recent literature, particularly with regard to the complexity of the innovation process, the evaluation system for evaluating innovation activities has been largely developed in order to understand the result.

For this, the Commission of the European Union (CEC) proposed on the macroeconomic side, a system used for benchmarking the level of development of innovative activity in the EU countries.

This comprises 19 indicators divided into 4 groups:

- Human resources;
- The generation of new knowledge;
- The transmission and application of knowledge;
- The funding of innovation and results of innovation activities.

- 1.1. The inputs of innovative activity:

These input indicators are mainly comprised of four elements:

- Financing;
- Human resources;
- The tangible and intangible investment;
- Links and partnership.

- 1.1.1. Financing:

At this stage, some authors found that inadequate resources and lack of a formal strategy for innovation, as well as excessive administrative regulations are the biggest obstacles to successful innovation [7].

In addition, some studies generated during tests on established key performance factors of innovation in the food industry, that companies with greater financial resources adequate, management,

technical, production and marketing are more successful in their innovation activities that firms have a lower availability of project resources [8].

We therefore assume that the financial support setting increases the chances of creating an effective product innovation.

1.1.2. Human resources:

On the other hand, human resources have been and remain a major factor in the success of any activity if they are properly oriented.

Thus in the success in the product development process, some authors provide a guide for success with project management tools for the product development process, emphasizing speed to market, quality management and work of multifunctional team [9].

We expect that the effectiveness of product innovation within the agri-food SMEs, mainly depend on the contribution of human resources in the innovation process.

Hence our second hypothesis:

Hypothesis 2: Facilitators are positively related to the effectiveness of product innovation within SMEs Moroccan food.

Hypothesis 2a: Financing is positively related to the effectiveness of product innovation within SMEs Moroccan food.

Hypothesis 2b: Human resources are positively related to the effectiveness of product innovation within SMEs Moroccan food.

1.1.3. The tangible and intangible investment:

These investments cover a range of different business spending in order to generate innovations.

In this context, national food SMEs seeking to achieve several objectives, such as increasing production capacity, reducing production time, the extension of the product range, improving product quality and well others.

In addition, and given the obstacles plaguing Moroccan IAA in terms of high transportation costs and price volatility of raw materials, the Moroccan food industry now faces a major challenge: how to modernize production methods and distribution of the various sectors and how to value agricultural resources for export diversification?

In the same context, agri-food SMEs need to invest more in intangible assets such as knowledge. This can occur through R & D or by the participation of qualified scientists and engineers who are a significant indicator of technological and scientific capabilities internally.

We therefore expect that the importance given to material and immaterial investment is positively associated with the efficiency of product innovation in food processing SMEs.

1.1.4. Links and partnerships:

In addition to internal capabilities, it is widely recognized that companies rely on external sources of information and other inputs when developing innovations.

Therefore, the type of cooperation assumed to exist in the Moroccan agri-environment requires the inclusion of all stakeholders in the sector that can improve the innovative activity in SMEs. These actors may be customers, research organizations, suppliers, associations, universities and others.

According to Diederer van Meijl and Wolters, this observation is supported by the fact that "the various external information sources including formal and informal contacts with the supply chain partners as well as the use of services tend to be particularly important for innovation" [10].

As for relations with universities or public research organizations in the food sector, some recent work highlight the growing number of collaborations between businesses and universities and the positive effect of cooperation on performance innovation [11].

We therefore expect that the collaborative relationships carried out by Moroccan food SMEs will participate in the improvement of innovative activity.

Hence our third hypothesis:

Hypothesis 3: Innovation activities are positively related to the effectiveness of product innovation within SMEs Moroccan food.

Hypothesis 3a: Tangible and intangible investments are positively related to the effectiveness of product innovation within SMEs Moroccan food.

Hypothesis 3b: Links and partnerships are positively related to the effectiveness of product innovation within SMEs Moroccan food.

1.2. Outputs:

These output indicators are constituted by two factors:

- The environment effects;
- The economic effects.

1.2.1. The environment effects:

This indicator refers to the microeconomic level, the effect of innovation on the effectiveness of resources allocated to the production thereof.

In other words, at this stage, we ask the question about the reaction of the environment to product innovation introduced. Is product innovation has reduced the use of energy, or did reduce the consumption of materials, etc.?

In this context, we can introduce the notion of "environmental innovation", which consists of new or modified processes, techniques, products and systems to replace ineffective energy practices to prevent or reduce damage to environment. This was considered by Murphy et al., As "an effective way of reaching a situation of" win-win "characterized by financial and environmental benefits" [12].

We therefore expect that the adoption of a product innovation respecting the notion of the environment would be favorable to the profitability of the new product in its ecological environment and on the market.

1.2.2. Economic effects:

This indicator captures generally, the economic success of innovation in employment, exports and sales.

Thus, According to Lawless and Fisher "successful launches of new products can offer a potential for companies to gain market position and achieve returns over the longer term " [13].

We seek to test the hypothesis that innovation process having achieved its internal targets may generate the innovation success on the market.

Hence our fourth hypothesis, which joined the first:

Hypothesis 4: A supportive and effective conduct of the objectives of product innovation is positively associated with the success of the latter in its environment and on the market.

Hypothesis 4a: As long as the product is effective internally of the company, it will reach its environmental goals.

Hypothesis 4b: As long as the product is effective internally of the company, it will reach its economic goals.

We can test also in this sense the effect that can have the respect of the environment on the profitability of the innovative product in the market.

Hence our fifth hypothesis:

Hypothesis 5: An innovative product realizing the environmental effectiveness also will be effective on the market.

From the above, our model for measuring product innovation under the "Process" approach is as follows:

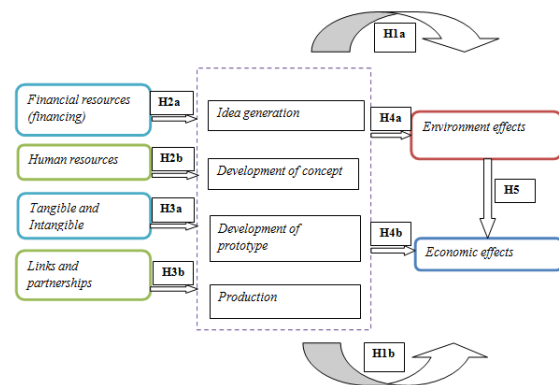


Figure-4: Proposed model for measuring product innovation in the "process" approach (source: model proposed by the author)

For this, our mathematical model takes the form of a linear regression equation, while assuming that the explanatory and explained variables are both quantitative.

We give below an example explaining the significance of relationships between the different variables of the model.

For a company i , knowing $i = 1, \dots, n$. We will have:

$$I.G.^1_i = \beta_0 + \beta_1 IndFin_{i1} + \beta_2 IndFin_{i2} + \dots + \beta_p IndFin_{ip} + e_i$$

With:

- I.G.¹: Objective 1 of Idea Generation phase;
- IndFin_p: Financing indicator, with p explanatory variables from IndFin₁, ..., to IndFin_p;
- E_i: residue $\sim N(0, \sigma^2)$

IV. CONCLUSION

The model proposed above offers a new approach based on objectives achieved at the innovative product through a specification of the stages through which it passes. Which refers to the "process" approach. Thus, and to make our model more meaningful, we specified two cases relating to the innovation process are a sequential process of innovation and a partially parallel process of innovation.

Until now, we were able to interviews with some of the seafood companies in the region of Souss Massa Draa located in the south of Morocco on the Atlantic coast. This allowed us to formalize the innovation process on which we conduct our research. In the desire to validate our model, we agreed to work on a set of homogeneous companies compared to the nature of them innovative product and in order to facilitate the comparison of results.

REFERENCES:

- [1] Kleinschmidt E. J. & Cooper R. G., *The impact of product innovativeness on performance*, Journal of Product Innovation Management, 8, 1991, 240-251.
- [2] Wernerfelt B., *A Resource-Based View of the Firm*, Strategic Management Journal, 5(2), 1984, 171-180
- [3] Galende and Suarez, *A resourced-based analysis of the factors determining a firm's R&D activities*, Research Policy, 28,1999, 891-905.
- [4] Chiesa V. & Frattini F., *Evaluation and Performance Measurement of Research and Development*, Journal of Product Innovation Management, 13, 1996, 105-136.
- [5] Schilling M. and Thérin F., *Gestion de l'Innovation Technologique* Saint-Germain, Paris, McGraw-Hill/Irwin, 2006).
- [6] Blindenbach-Driessen, F.P., Van Dalen, J., Van Den Ende, J., *A critical assessment of performance measurement of NPD Project*. In : Proceedings of the 12th International Product Development Management Conference, 2005, Copenhagen, Denmark.
- [7] Jamrog, J.J. *The Quest for Innovation : A global study of innovation management 2005-2016*, (Human Resource Institute, University of Tampa, Tampa, FL, New York : American Management Association, ©2006).
- [8] Frances T.J.M. Fortuin & S.W.F. (Onno) Omta, *Innovation drivers and barriers in food processing*, British food journal, 111(8), 2009, 839-851.
- [9] Rosenau M.D. & Moran J.J. *Managing the Development of New Products: Achieving Speed and Quality Simultaneously through Multifunctional Teamwork*, (Van Nostrand Reinhold, New York, Hardcover, 1993).
- [10] Avermaetea T., Viaenea J., Morganb E.J. with Eamonn Pittsc Nick Crawfordb & Mahon D., *Determinants of product and process innovation in small food manufacturing firms*, Trends in Food Science & Technology, 15, 2004, 474-483.
- [11] Lööf H., Bolstrom A., *Does knowledge diffusion between University and Industry increase innovativeness ?*, The Journal of Technology Transfert, 33(1), 2008, 73-90.
- [12] Li Y., *Environmental innovation practices and performance: Moderating effect of resource commitment*, Journal of Cleaner Production, 66, 2014, 450-458.
- [13] Yam R.C.M., Cheng Guan J., Fai Pun K., & Tang E.P.Y., *An audit of technological innovation capabilities in chinese firms : Some empirical findings in Beijing, China*, Research Policy, 33, 2004, 1123-1140.