

COMPARATIVE ANALYSIS OF PRODUCT DEVELOPMENT PROCESS MANAGEMENT AT FOOD INDUSTRIES

Melisa De Greef¹, Leticia Arcusin² & Germán Rossetti³

¹ melisadegreef@gmail.com, ² larcusin@fiq.unl.edu.ar, ³ groseti@fiq.unl.edu.ar

Department of Industrial Engineering, Faculty of Chemical Engineering, Universidad Nacional del Litoral
Tel.: +54 342 4571164, int. 2581, Santiago del Estero 2829, 3000, Santa Fe, Argentina

ABSTRACT

Product Development Process (PDP) is a systematic activity whose purpose is to generate new products, either by introducing changes to an existing product or creating a new one. At food industries, the PDP is crucial, because the scene where they operate is highly competitive, which means that the structure of PDP Management becomes essential to remain in the market.

The paper presents a comparative analysis of PDP management at food companies located in Santa Fe (Argentina), which belong to three sectors, selected according to their importance for the region and defined based on the classification proposed for Manufacturing Industry by a national public entity: dairy products (Manufacture of dairy products), supplies (defined from items Preparation of fruits, vegetables and legumes and Manufacture of food products not classified) and meat (production and processing of meat and meat products). The analysis describes the current practices of the companies under study and proceeds to compare them with the activities proposed by a Reference Model for the food industry.

Among the key findings it stresses that only some companies have methodologies and practices for PDP management internalized. In addition, there are substantial differences in relation to the systematization detail levels of PDP activities. On one hand, these differences are observed at an individual level among companies of the same sector, in general associated with organizations size. On the other hand, are distinguished from the comparison between different sectors, where dairy and supplies sectors present higher level of PDP development.

Key Words: *Product Development Process, Food Industries, Management.*

1. INTRODUCTION

Product development process (hereinafter, PDP) is the systematic task to generate new products, either by introducing changes to an existing product or creating a completely new and original [1].

At food producing, industries PDP is crucial, because the scenario where companies develop is characterized by high levels of competitiveness and rapid evolution in many perspectives: food security, sustainability, nanotechnology, packaging, among others [2]. Properly management of the process implies that companies apply specific methods and tools, which allows them to increase their effectiveness and also their benefits.

The aim of the present work is to analyze the management of Product Development Process at food industries from Santa Fe, Argentina. To achieve this goal, usual practices of analyzed companies are described and then compared with a Reference model of PDP for food industry developed by Penso [3].

This research is part of a project aimed to propose a PDP Management Model in food industries from Santa Fe, Argentina. The paper presents preliminary results of eight companies from the region [4].

2. METHODOLOGY

This research is exploratory-descriptive, and its main purpose is to make a comparative analysis of the usual practices related to the management of the Product Development Process at food companies, located in Santa Fe (Argentina). Companies belong to three activity sectors, selected according to their importance for the region and defined based on a classification proposed by a National Agency: dairy (*Dairy processing*); Inputs (defined by items *Preparation of fruits, vegetables and pulses* and *Processing of unclassified food products*) and meats (*Meat Production and Processing*). For the analysis, usual practices of the companies are described and then compared with the activities proposed by a Reference Model for food industry.

In order to analyze the way companies carry out PDP Management (activities, information, resources and organization), a survey is made through semi-structured interviews and on-site observation in eight companies, hereinafter referred to as A, B, C, D, E, F, G, and H. The applied questionnaire is divided into two topics: (i) general information about the company (size, structure, type of product manufactured, market) and (ii) information of activities related to PDP Management (grouped according to Reference Model macrophases: Pre-Development, Development and Post-Development). Interviews are attended by product development personnel or by a manager.

3. REFERENCE MODELS

Product development is a complex process, whereby an organization transforms market opportunities and technical possibilities in information for the manufacture of a commercial product [3]. Therefore, this activity requires research, planning, control and use of systematic methods. PDP involves all areas of the organization and generates a varied amount of information, and is integrated by phases ranging from identifying consumer needs to launching and tracking the product on the market [2]. It should be noted, according to Penso [3], that product development is understood to be both the development of new products and the modification or re-launch of existing products.

In the literature there are different proposals for systematizing product development activities in PDP models, depending on the area of knowledge authors developed. However, in many cases differences between these proposals are more terminological than conceptual [5].

Rozenfeld et al. [6] presents a most complete contribution of PDP, separating the process into three macrophases: Pre-development, Development and Post-development. Authors provide a reference model that can be adaptable to different business sectors.

In relation to the food sector, product development models that can be mentioned are: Graf et al. [7], Fuller [8], Galizzi et al. [9], Earle [10] and finally the model designed by Penso [3]. These authors propose structured phases that facilitate the understanding and realization of the development process at food industry.

The reference model developed by Penso [3], which is based on the methodology proposed by Rozenfeld, make improvements of previously published models, providing an approach to the particularities of food products development. Penso [3] model is structured in three macrophases: pre-development, development and post-development. Macrophases are similar to Rozenfeld et al. [6] model, differentiating by adding some specific activities of the food area in the development phase: (i) conceptual design: product specific formula, manufacturing processes, packaging, parameters, validation process and timeline; (ii) detailed design: elaboration of product design and packaging, advanced specification of manufacturing process, packaging, stock and distribution, revision of the GMP (Good Manufacturing Practices) manual, training of staff and elaboration of quality procedure manuals, such as HACCP (Hazard Analysis and Critical Control Points); (iii) production preparation: pilot batch production and physical-chemical, microbiological, sensory and stability tests of the product. In addition, the model emphasizes the importance of control points (Gates), as decision points that allow product projects to be evaluated during the process on different aspects (financial, economic and technical feasibility, risk analysis, among others) . Figure 1 presents the Reference Model proposed by Penso [3].

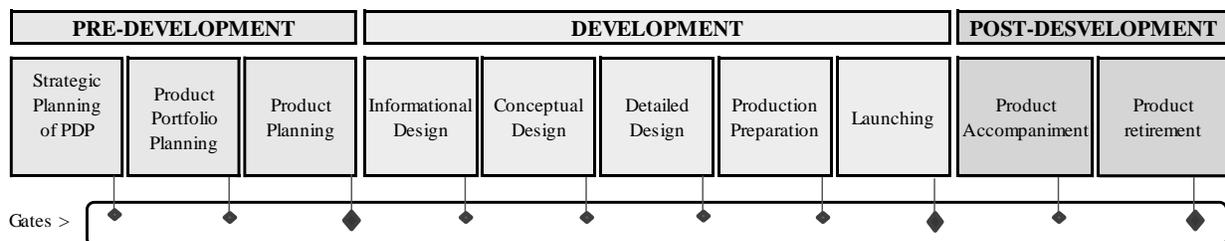


Figure 1. Reference Model for Product Development Process Management.

4. DISCUSSION

4.1 Companies Description

Analyzed companies are located in Region 3- Santa Fe Node, Argentina (San Justo, Garay, La Capital, Las Colonias, San Javier and San Jerónimo), according to a regionalization defined by provincial government.

Regarding companies size, the Secretariat of Entrepreneurs and Small and Medium Enterprise, through Resolution 11/2016, establishes the classification of Micro, Small and Medium, and Large company, depending on their annual

sales, in Argentinean pesos (Large: total annual sales greater than \$ 540,000,000; Medium between 45,500,000 up to 540,000,000 and Small: up to 45,500,000) [11]. Companies A, B, C, D, E and H are then classified as Large Companies, while F and G are Small.

Companies A, B and C belong to the Dairy sector and offer different product lines, which can be grouped in Milk (Traditional, Fortified, UAT -Ultra High Temperature-), Cheese (Hard, Medium, Soft, Special, Low Calories), Dulce de leche (Traditional, Light), Yogurts (Traditional, Flavored, Low Calories), Milk Powder, among others (Ricotta, Milk Cream, Butter, Rice with Milk). Company A has 207 products, company B 59 and company C 160, all of them offered in different presentations. Marketing activities of the three companies cover the national territory and several countries of the five continents.

Companies D and E belong to input sector, mainly foodstuffs, destined to diverse industries: dairy, sweets, drinks, baking, meat, etc., and can even include other industries like cosmetics, photography, fertilizers, among others. Company D produces fruit preparations, while the main activity of company E is to provide solutions based on gelatins and hydrolysates. Both organizations offer different product lines, and its distinctive attribute is the elaboration of products according to the requirements of each application, involving a high degree of cooperation of clients in the development. Marketing activities of both companies cover the national territory and numerous countries of the five continents.

Finally, companies F, G and H belong to the meat sector. F manufactures deli meats, sausages and pork for retail sale (fresh meats, cooked ham, raw ham, bacon, sausage, snack sausage) and supplies regional areas (Rafaela, Paraná, Rosario). Business of company G is based on pigs, and it elaborates 60 different types of products, which are divided into three families: Deli meats, Processed Products and Fresh Cuts. Most of these products are offered vacuum packed in franchises located in Santa Fe city. Company H offer different products from chicken (legs, thigh leg, thighs, breast, supreme, filet, special chicken and whole chicken class A), all split and packaged.

4.2 Description of PDP on analyzed companies

Companies interviewed, in agreement with mentioned authors, conceive as product development both launching of new products and the re-launch or modification of existing products, and some of them have structured mechanisms for the management of the PDP.

Company A has a Development Department, which has the same hierarchy as the Departments "Marketing", "Purchases" and "Production and Processes". PDP management is systematized, nevertheless is recognized as a dynamic process, since it contains re-cycles depending on the validation of certain critical points.

At company B development function is included in the Research and Development (R&D) Department, which depends on Quality Department. The management of the PDP is structured as sequenced activities, where different stages and areas involved depend on the type of product to be developed, magnitude of the project, commercial strategies, markets to be reached, among others aspects.

At company C, PDP management is completely systematized, and has an extended degree of detail regarding activities, responsibilities and documentation involved, which shows that the process is installed in the organization.

At companies D and E, PDP depends on the R&D Department. In company D, PDP management has also an extended degree of detail regarding activities, responsibilities and documentation involved, which shows that the process is installed in the organization. A key factor for the company is the time that takes to complete the PDP: each project differs depending on whether it is a new product or a modification of an existing product (in this case, is a shorter time); according to market sectors (for Ice-cream and Frozen segments, for example, development times are higher due to the requiring of more tests) and according to the type of customers (company has a customer classification, type A, B and C).

In company E PDP management is completely systematized, and the different stages and areas involved depend on the scale of the project to be developed and its degree of innovation. Projects are classified as "PMOs" (large-scale, medium/long-term projects, generally innovative for the company, involving additional human resources, equipment or economic resources, requiring interdepartmental coordination) and "Workrequest" (are studies, investigations or trials of smaller magnitude, less innovation, and faster execution, which are performed as a service for other departments or customer requests, where only some components or concentrations are modified).

In company F, on the other hand, PDP is not systematized or structured. Events of product development are minimal, since company ensures that market does not require frequent product innovation.

While companies G and H develop some PDP management activities, the process is still incipient. Company G makes at least two developments per year, while in company H, whose products are traditional and has loyal customers, developments are sporadic and are linked mainly for export.

Table 1 presents a comparison between the Penso Model and the PDP practices developed by companies analyzed.

Table 1. Comparison of Penso Model (2003) and analyzed companies analyzed.

Penso Model			Company								
Macro phases	Phases	Activities	A	B	C	D	E	F	G	H	
Pre-Development	Strategic Planning of PDP	Collect information for strategic alignment	✓	✓	✓	✓	✓		✓	✓	
		Strategic alignment	✓	✓	✓	✓	✓		✓	✓	
		Develop the PDP Strategic Plan			✓						
		Define PDP evaluation criteria			✓	✓	✓				
		Register Lessons Learned			✓						
	Strategic Planning of PDP	Collect information for strategic alignment	✓	✓	✓	✓	✓			✓	✓
		Strategic alignment	✓	✓	✓	✓	✓			✓	✓
		Develop the PDP Strategic Plan			✓						
		Define PDP evaluation criteria			✓	✓	✓				
		Register Lessons Learned			✓						
	Product Portfolio Planning	Updating Product Portfolio		✓	✓	✓	✓			✓	✓
		Planning of Product Portfolio Projects			✓					✓	✓
		Register Lessons Learned			✓						
	Product Planning	Define guidelines for product planning			✓	✓	✓				
		Identify opportunities	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Select new product opportunity	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Gather information for opportunity specification	✓	✓	✓	✓	✓				
		Elaborate opportunity specification			✓	✓	✓				
		Develop the Product Design Plan	✓	✓	✓	✓	✓				
		Register Lessons Learned			✓	✓					
	Development	Informational Design	Elaborate Information Design Plan			✓					
Obtain information for Product Design			✓	✓	✓	✓	✓		✓		
Describe product life cycle					✓	✓				✓	✓
Quality Function Deployment			✓	✓	✓	✓	✓				
Gather information for design specification					✓	✓	✓				
Register Lessons Learned					✓		✓				
Conceptual Design		Elaborate Conceptual Design Plan			✓						
		Generate ideas for the basic structure of the product	✓	✓	✓	✓	✓				
		Develop alternatives to product design			✓						
		Evaluate product conception alternatives	✓	✓	✓	✓	✓				
		Perform analysis of production costs of the product	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Compile prototype report			✓	✓	✓				
		Select Suppliers	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Register Lessons Learned			✓	✓	✓				

	Detailed Design	Develop Detailed Design Plan			✓						
		Product detail	✓	✓	✓	✓	✓		✓	✓	
		Packing design	✓	✓	✓				✓		
		Develop the Quality Plan for suppliers	✓		✓						
		Design the manufacturing / packaging / storage / distribution process	✓	✓	✓	✓	✓	✓	✓	✓	
	Production Preparation	Planning the production of pilot batch	✓		✓	✓	✓				
		Elaborate product retirement plan									
		Elaborate detailed project of product and process			✓	✓	✓				
		Register Lessons Learned			✓	✓	✓				
		Produce pilot lot	✓	✓	✓	✓	✓		✓		
		Analyze pilot sample sample	✓	✓	✓	✓	✓		✓		
		Product and process homologation	✓		✓	✓	✓	✓	✓	✓	
		Product and process registration			✓		✓	✓			
		Start Production	✓	✓	✓	✓	✓	✓			
		Register customers of the product			✓			✓			
	Register Lessons Learned	✓		✓	✓	✓					
	Launching	Detail Procedures of Consumer Services									
		Prepare advertising material							✓		
		Implement product launch strategies	✓	✓	✓				✓		
		Register Lessons Learned			✓		✓				
Post- Development	Product Accompaniment	Perform post-project audit	✓		✓						
		Evaluate customer satisfaction	✓	✓				✓	✓	✓	
		Product performance monitoring	✓		✓				✓	✓	✓
		Plan of modifications for improvements	✓								
		Register Lessons Learned									
	Product retirement	Implement product recall plan									
		Evaluate economic and financial results	✓		✓	✓	✓		✓		
	Register Lessons Learned										

Source: Authors, based on Penso model and information from interviews.

4.2.1 Pre Development Macrophase:

In relation to the phases that compose this macrophase, only the company C implement all the activities proposed by the Model, while A, B, D, E, G and H are focused on associate their generic strategies to the opportunities identified for product development.

Companies of dairy sector recognize the importance of aligning PDP planning with the strategic business planning. For this reason, in most of the cases, launching or re-launching of products corresponds to strategic decisions related to, for example, positioning products, expanding markets, protecting leadership positions, among others. It should be mentioned that, more frequently, PDP is oriented to the improvement of existing products and not to the generation of new products, since the interviewees characterize Argentine dairy industry as a mature and traditional sector.

In this sector, ideas of new products come from different sources, which are mainly common to the three companies: market research, company members (production staff and managers), distributors and points of sale, competition and analysis of the company's portfolio. It should be noted that at A and B, Market Research service is made by specialized consultants, while C performs internally this activity, since company considers essential to manage the information that emerges from this type of studies in a confidential way.

In this macrophase, decision-making processes are fundamental. Companies A, B and C have structured mechanisms for communication and instances of approval.

Potential developments are guided, in A and C, by the Marketing Department, and in B by the R&D Department, who are in charge of monitoring the progress of PDP, forming work teams and designating their leader according to the characteristics of each project, providing relevant information, coordinating regular meetings and conducting an adequate follow-up. Information evaluated ir generally focus on manufacturing costs and consumers needs. The

development time, although not mentioned as an element to be taken into account when making decisions, is implicitly considered, as well as the feasibility of manufacturing and necessary equipment.

Companies D and E also recognize the importance of aligning PDP planning with strategic business planning. In a large percentage, product launches or re-launches are related to customer requests, and companies respond to them if they relate to corporate strategies.

In the input sector, new product ideas arise mainly from customer requirements, and also proactively. In the first case, projects are unique and differentiated, since they respond to the specific needs of each client (tailor-made). In the second case, they result from conferences, world fairs, innovation magazines, competitors, new trends, company annual meetings (in D, there are two types: a “concept meeting” where each subsidiary presents the product concepts of its region, and a “marketing meeting” where the marketing trends of each regions are presented). Potential developments are guided by the R&D Department, which is in charge of monitoring the progress of PDP.

In company D, a Brief is generated which contains general data about the project, objectives, consumers, dates and launches, estimated sales volume, costs, characteristics and formulation, etc. There is also a Risk Analysis document, which evaluates the potential impact of the project if its execution is approved. It should be noted that the developments are conducted by the same work team, conformed by members of the areas involved in each project.

Company E has different PDP management mechanisms depending on the type of the project. In PMOs, a Project Proposal is made and, depending on the characteristics of the project, a Project Manager is selected. The Project Proposal defines the idea, purpose and objectives, scope, a preliminary study of costs and benefits, functional and performance requirements, information originated in previous projects and a general plan of milestones. This document is presented by the Project Manager to Directory. The objective of the Project Proposal is to evaluate the potential project and decide its approval. This document also details the potential risks to Food Safety, Occupational Health and Safety and Environmental Aspects, as well as the risks of the project to the company in terms of market, strategy and profitability. In the case of a Workrequest, a Workplan is elaborated, and once approved is registered in a Share-Point, which contains a project code, the name, objective, responsible and a list of requirements related to that project, which facilitates the subsequent development of each one.

In the company F and H, ideas of new products or modifications of the existing ones generally arise from the managers of the company, as copy of competitor’s products or to obtain a better use of waste.

In G, ideas arise mainly from consumption trends, multinational competitors, and from the company's own staff. Company launches new products every 6 months, so that customers can usually find different products at sale points.

4.2.2 Development Macrophase:

At organizations in the dairy sector, PDP team delegates activities in the development area, which according to the company receives different names (Development Department, R & D Department and Quality Department).

There are differences between the companies depending on the activities executed in the Development, regarding the number of tasks and its depth. Thus, for example, in company B the process is aimed to get satisfactory pilot samples by "trial-and-error". On the other hand, company A shows a great detail degree in tasks related to informational design (life cycle analysis, quality), conceptual design (product basic structure, production costs analysis) and detailed design (pilot lot plan, quality plan for suppliers), emphasizing the registration of results obtained. Finally, in company C a meticulous detail of the process is observed in relation to the tasks to be performed, documentation, responsible for approval, times and scope. For example, in order to materialize a new development idea there are multiple documents in which relevant information is registered, among which an "Approval File" can be mentioned, which includes data inherent to the quantity of pilot lots to be produced, critical points control, risk management, label information, etc., and requires the approval of Marketing, Quality, Development departments and also of management.

Considering the sector to which analyzed companies belong, different type of analyzes are needed in order to ensure food safety. The three companies emphasize in this macrophase the execution of Physical-Chemical and Microbiological Analysis and of Useful Life Determination with specific and detailed methods that guarantee the quality of products, as well as Sensorial Analysis to achieve consumer acceptance (sensitivity, appearance, color, taste, texture, dimensions, uses, etc.). Test and analysis depend on the type of product to be developed and the novelty it represents for the company (as an example, a new yogurt flavor requires less development than a new variety of cheese).

A key activity of this macrophase is the documentation of information obtained, decisions made and learned lessons. Dairy companies recognize the importance of registration, but there are substantial differences in their application. In company C documentation is a habit, and it is not possible to move on in a project development if the following reports are not presented: "Product Specification Sheet", "Approval File", "Documentary File", "Process and Formulation File", "Authorized Data Sheet" and "Suppliers File". Company A has a Product Data Sheet, where all specifications of each project development (including mistakes and successes) are recorded in a unified form, whether or not it results in an effective product launch. Finally, company B documents each project only when an economic and productive analysis is approved, implying the loss of information that could be valuable for future developments.

In the last phase of the development, three dairy companies focus on the definition of commercial strategies for product launch, in relation to price, distribution channels and promotion.

In the case of companies from input sector, activities of this macrophase have the highest level of standardization, due to the importance of inputs development for food products.

In company D, PDP continues when the Brief is sent to the laboratory, where several samples are produced and then sent to the client, generating a loop until satisfactory results are obtained. A Process Sheet is then prepared, containing input formulation and specifications. Once these documents are approved, a preliminary industrial test is elaborated in a production unit (a container), which is sent to the client, generating a new loop until its approval. After this stages, a scaling is made in order to test mass production, and consist on the preparation of n containers (scaling requires at least 3 productions). During these productions, development area monitors the product at different control points (parameters included in the Process Sheet, application and variability of developed formulas, etc.), generating Control Charts that allow evaluating the process, in order to make corrective actions if necessary. If the customer is satisfied with the result of industrial test, meetings are held with the departments of Production, Quality, Finance and any other sector involved in the project, and finally a document is signed that validates the process and the result achieved. After this, input manufacture is formally incorporated in the planning production of the company.

In relation to company E, PDP continues according to the type of project. In the PMO, once the Project Proposal is approved, a Project Charter is carried out, which contains a detail of the project (objectives, product specifications, deadlines, work equipment and legal requirements). It should be noted that, unlike Company D, a specific work team is conformed for each project, whit members of departments involved (in general, Finance, Sales, Technical Applications, Quality and Legal). Once the Project Charter is approved, a project monitoring process is initiated, through meetings coordinated by the Project Manager, who is responsible for presenting the results of each PDP stage. Results should allow the verification of the elements contained in the Project Proposal (product quality results, process variables, operational conditions, etc.), and are summarized in a Project Development and Transfer. At these meetings, it is expected that all staff involved make a critical follow-up of the project stages, and all comments are uploaded to a Discussion Forum. Top Management evaluates different alternatives in relation to the project (go ahead -GO-, discontinue it -STOP- or leave it on hold -HOLD-). In addition, the company has a PMO manager who controls the progress of the project portfolio.

One of the main activities of the Project Proposal are the laboratory tests, for which a Workplan is elaborated, containing detailed information of expected formulations, analyzes to be made, and a work schedule. At this stage the company considers especially relevant to carry out bibliographical and patents studies. After an Internal Validation, the product is sent to customer for an External Validation, to ensure that satisfy the requirements for its specified application. This can be performed through external laboratory tests or by the client. If results are satisfactory, they are scaled in a plant level by a pilot test, in order to check the reproducibility and consistency of the development. This feedback process is continued until the client provides a final validation of the project. Once the final product is obtained, and its production process, Top Management takes the decision to launch the product, especially in cases where the project has arisen proactively. All PDP information is recorded in the Project Closure of each project. After this, company formally incorporates the product and the process into its production plans.

For Workrequest, project tracking is done using Share-Point, and Macrophase activities are simplified, requiring only laboratory tests and feedback with applicants (clients or other departments).

Also in this sector companies emphasize the execution of Physical and Microbiological Analysis and of Useful Life Determination to guarantee products quality, and of Sensory Analysis to achieve consumer acceptance.

Another key aspect of this macrophase is the documentation of obtained information, decisions made and lessons learned. Companies recognize the importance of these activities, but there are some differences in their application.

In company E documentation is a habit, and it is only possible to advance in the development of a project if all the reports are presented (Project Proposal, Project Charter, Project Development and Transfer, Project Closure, Workplan). Company D has a Brief and a Process Sheet, where all the specifications of each project are documented unified but only when it has fulfilled a positive economic and productive analysis, which implies the loss of information.

Finally, in the last phase of Development, which refers to the Launching of the product, it is observed that there is no formalization of the process. This may be, on the one hand, due to the fact that most of the products arise from customer orders and, on the other hand, because companies are not in contact with final consumers and therefore positioning their products does not represent an essential activity.

As far as the meat sector is concerned, company F is the one that carries forward the development in a less structured way: once the product idea is selected, no specific methodology is followed. The product is attempted from "trial and error" and, if necessary, an external laboratory is consulted, which also provides advice.

In companies G and H, PDP also does not follow a previously defined methodology, and guided by a multidisciplinary team where plant manager and sales and administration managers participate. This team conducts periodic meetings where information is exchanged through a brainstorm. Products tests are made by the company staff through sensorial analysis.

4.2.3 Post Development Macrophase:

At this macro phase, the three companies in the dairy sector reported monitoring the products on the market, comparing the projections made with results obtained, and, based on this information, top management takes the decision of continue or retire the product. For product accompaniment, no company has any formally constituted equipment, and is an activity developed by the Marketing Department, due to its contact with customers. Finally, it is mentioned that none of the companies analyzed elaborates a plan of product retirement, and that decision is made according product acceptance in the market. Three companies expressed the importance of applying Traceability in their products, in order to realize an adequate monitoring of them and proceed to remove a certain lot if possible incident occurs.

At inputs sector it is observed that this Macrophase is the one with least systematization. Companies D and E do not claim monitoring products on the market; work is limited to compare projections made with results obtained. Activities carried out in this Macrophase are fundamentally oriented to the Removal of products in case of any eventuality. It should be noted that the final product of the companies analyzed represents intermediate products for their customers, who are oriented to final consumers market. If a problem is identified by customers of analyzed companies before the elaboration of their final products, companies D and E assume the responsibility and the costs of withdrawing the production. If a problem is detected by final consumer, and only when is verified that responsibility lies on analyzed companies, all final products are removed from the market with the collaboration of their customers and every costs must be assumed by the organizations. It is why companies recognize the importance of applying Traceability.

At meat sector, company F tests its products directly on the market, in its own sales points: if sales generate profits, production continues; otherwise, products are recalled. In G, product tracking is conducted both qualitatively (customer opinion) and quantitatively (sales level and profitability). With this information, if necessary, a decision is taken to discontinue the product or to offer it in a different presentation.

Company H, in the few opportunities in which a product development take place, conduces product tracking activities generally related to the requirements of international trade.

5. CONCLUSIONS

The objective of the present work was to analyze the Management of Product Development Process at food industries from Santa Fe. The Model elaborated by Penso [3] was used as reference to compare the practices related to the PDP conducted by the companies under study.

Among the main conclusions is observed that only some companies have internalized methodologies and practices for PDP Management. In addition, there are substantial differences in relation to the levels of detail presented by the systematization of activities that PPD involves. These can be observed, on the one hand, between companies belonging to the same sector, generally associated with the size of the organizations (larger scale, higher degree of PDP systematization) and, on the other hand, between sectors studied, with dairy and inputs being the sectors with the highest level PDP development.

From the analysis, it is observed that companies A, B, C, D and E (dairy and inputs sectors) have a defined PDP Management model and that PDP methodologies and practices are internalized for their systematic application, while companies F, G and H (meat sector) have limited systematization of PDP Management.

In relation to the model taken as reference, companies only develop some of the proposed phases.

As regards Pre-Development, companies A, B, C, D and E focus on updating their portfolio based on strategic decisions taken and the market in which they operate, allowing them to identify context opportunities, select new products and define guidelines for its planning. However, there is no evidence of adequate systematization or registrations of lessons learned during these phases. In F, G and H, activities of this macrophase are absent.

Due to the nature of food sector, characterized by food safety requirements and quality demanded by customers and final consumers, phases that integrate the Development Macrophase are the most consolidated. In the dairy and input sectors, a great level of detail is observed in the systematization of the activities, evidenced in the amount of documentation used, control points and validations required. At meat sector, however, development activities are made in a smaller degree of detail.

Finally, Post-development macrophase presents the lowest systematization in all companies analyzed. Activities are basically oriented to the withdrawal of products in case of any eventuality.

The use of a reference model for PDP organizes and directs the development of new products, favoring innovations, as well as the success of the product in the market. Penso Model [3] was useful for analyzing the companies under study, since it presents an adequate level of detail that allows the comparison of PDP. Regarding the author's proposal, companies in the dairy sector and in the input sector, although they have different levels of systematization, could strengthen Pre-Development and Post-Development macrophases, especially the systematization of the activities related to strategic aspects of business and monitoring the product in the market. While companies in the meat sector should begin with the application of small interventions in the PDP management in order to achieve partial and incremental improvements in the process.

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BIOGRAPHIES

Dr. Germán Rossetti is a chemical engineer, from UNL, Santa Fe, Argentina, and Ph.D from the same University. He is the director in the Dept of Industrial Engineering, and his research area includes product development management and project management.

M. Sc. Leticia Arcusin is pursuing Ph.D Degree in Administration from UNR University, Rosario, Argentina. She has completed her master degree in Strategic Business Management from UNaM, Misiones, Argentina. Her research area includes product development management.

BBA Melisa De Greef is pursuing Ph.D Degree in Administration from UNR University, Rosario, Argentina. She has completed his studies in Business Administration at UNL, Santa Fe, Argentina. Her research area includes product development management.