
The Main Problems in the Product Development Process Carried out by Large-sized Companies of the Brazilian Agricultural Machines and Implements Sector

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Abstract. In Brazil, the industry of agricultural machines and implements represents a significant growth potential, focusing on the increase of product exportation as an alternative to reach better distributed merchandise value throughout the year, thus aiming at overcoming the problems of internal seasonality. It is therefore necessary for the industry to develop products, whose lesser cost and adequate quality levels allow meeting the needs of major producer customers and the Brazilian market, which is characterized by a constant search for technological solutions and sophisticated products. Even with the growth potential of this sector, its products development process continues to present problems, management included, resulting in poorer performance of projects and products and Companies should accept those problems as actual and concrete facts, so that actions may be initiated to prevent long lasting unsolved situations and eventual barriers to the company competitiveness. By means of a descriptive exploratory study, the purpose of this paper is to identify and analyze the main difficulties encountered by large-sized Brazilian companies, located in the State of São Paulo, which manufacture agricultural machines and implements.

Keywords. Product development process, agricultural machines industry, product development process management

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1 Introduction

The Brazilian agricultural machines and implements industry (AMIs) shows a high potential growth for the years to come, which is linked to the domestic agriculture growth, being the increased utilization of agricultural machines and implements one of the main reasons of agriculture good productivity performance. Such demand for MIAs calls for the development of products which yield better performance and best fit the territorial topographic conditions; namely, a MIA utilized in a flat region should be adapted to operate in more irregular terrains. However, product development departments face many daily difficulties which directly affect the performance of such process.

Some of those problems are rooted in historic aspects of the origin of such industrial sector, since grounding projects on equipments developed in other countries was a common practice by the local industry. That resulted in various difficulties due to climate and topographic characteristics different from the Brazilian territory, jeopardizing the products performance and, consequently, the culture [6].

Amongst the main problems experienced by the MIAs, those related to work accidents due to product dimensioning [7] can be mentioned, as well as precision problems and, chiefly in seeding and spraying activities [6] and [4]. Those problems are failures due to product development process (PDP).

This paper discusses the difficulties MIAs face during PDP and which directly affect their performance.

It is important that companies be aware of what their difficulties are, because, with the aid of a diagnose it is possible to work on problems solutions to prevent their consolidation and build up of a competitiveness blocking barrier.

This paper aims, thru an exploratory descriptive research, at identifying the main difficulties faced by large-sized MIAs located in the State of São Paulo. To achieve the objective, all the agricultural machines companies matching this profile were identified. The screening yielded five companies, which were later visited to interview the person responsible for Product Development, to identify the main difficulties those companies cope with during the product development.

Despite the fact that all five companies showed the same profile, the heterogeneous nature of their problems was observed, leading to at least three group categories: financial difficulties, personnel difficulties and technical problems like product project and validation, each one of them adversely affecting PDP specific aspects.

2 The Product Development Process and its Management

The new product development takes place thru a business process, PDP, starting with the identification of a market need which is later turned into a new product. To allow that, it is necessary to identify and translate the market needs, the technological possibilities and limitations, into product project specifications and its productive process. Parallel to those activities, production and product market launch planning are two important activities to take place. After the product

launch, PDP is responsible to watch the new product behavior, in actual use and production, carrying out, whenever necessary, eventual product specifications or process changes, until the product withdrawal from the market [5].

PDP is the manner how the company realizes and manages the set of products which will originate new products. Namely, product projects flow along PDP, which in any given company shows some basic phases common to all the projects, although phases of each project are individually treated [5].

PDP shows some peculiarities, like high degree of uncertainties related to this process; administration of multiply sourced information, like customers, suppliers and various company areas; diversity of requirements the new product project must meet, involving customer requirements, manufacture capacity to realize the project, necessary technical assistance services and recycling at the end of the product life cycle [5].

Any organization searching for competitiveness thru a new product should focus on time-quality-productivity based indicators [5]. Good PDP performance depends on characteristics such as well defined project objectives, focus on time and market, internal integration to the project, integration amongst company areas involved in the project, high quality prototyping and strong leadership exercised by the project team. Thru those management characteristics, a quick and efficient development is sought for, which will yield competitive processes [1].

Nevertheless, depending on the complexity inherent to PDP, companies commonly face difficulties in managing this process which directly affect its performance.

2.1 PDP - Related Problems

Not always does the reality of a new product development process matches theory, problems commonly surge along this process which are to be known by companies to prevent their repetition.

Amongst the most common causes of product development problems [1], following can be mentioned:

- *Moving objectives*: frequently, do not the basic product or process consider changes, whether technological or market wise, taking place during the project. This is likely to occur when the project is based on an apparently stable technology aiming at a specific market which suddenly changes, or assumptions are made on distribution channels which are fairly constant.

- *Isolation of the product development department (DP)*: when the company developing a product owns more than one productive unit, the product development department DP commonly performs isolated, which is likely to cause communication problems amongst the DP and marketing, production, finance, departments, etc., etc

- *Misunderstandings amongst the company functional areas*: what a given area of the company expects or imagines from other area may be unreal or impossible to be achieved. Frequently, the areas involved in PDP do not understand each other, use different languages or measure results in a different manner. Frequent misunderstandings between the marketing and technical areas, for example, are due to unreliable market research.

- *Time to identify need or opportunity versus time to market*: a considerable time segment may exist between the decision to develop a new product, namely, the surge of an idea, and its effective development; besides, not always will the product discoverer company be the one that most will benefit.

- *Lack of product differentiation*: new product development frequently ends up in frustration because the new product is not absolutely innovative in the market, or it is easily imitable.

- *Unexpected technical problems*: delays or exceeding costs may overload the company technical capabilities or simply result in lack of resources.

- *Problems solution delay*: product development involves activities with a certain degree of uncertainties, however, it is common that companies allocate resources almost entirely for known project requirements, leaving nothing or very little available for unexpected events.

- *Personal issues*: as explained above, the product development process may fail and, in such cases, it is necessary that the organization refrains from hunting people to blame for the failure. Rather, learning with mistakes so as to prevent their repetition, should be the company-wide managerial behavior; nevertheless, the search for a guilty makes the work ambient conflictive and unfavorable to innovations. Summarizing, most common failures in a new products and processes development process are related to: focus on the individual project to ensure fastness, manufacture execution, provision of sufficient *initial information* to plan ahead, and articulate individual projects with the company competitive strategy.

3 Research Method

The research was carried out by means of an exploratory descriptive study involving the following activities: bibliographic research on the subject, mapping and identification of companies matching the intended profile, design and preparation of an interview semi-structured check-list, visiting companies and check-list application while interviewing the responsible for PDP, obtained data description and analysis.

The bibliographic review included the product development process and its management as well as the main related problems; this activity also involved getting to know outstanding characteristics of the Brazilian agricultural machines and implements industry.

Based on the knowledge acquired on PDP management and the industry, a semi-structured check list was prepared so as to identify noteworthy difficulties those industries face during the PDP.

Data obtained from ANFAVEA-Associação Nacional dos Fabricantes de Veículos Automotores and also from IBGE-Instituto Brasileiro de Geografia e Estatísticas, allowed to identify in the State of São Paulo, within August 2005 and January 2006, five national capital large companies (according to the head count). All those companies, when visited, showed evidences they had developed products between 2003 and 2005. After the visits and interviews, the data obtained were analyzed.

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4 Field Research

This item will show the results of the field research conducted in five large size national companies located in the State of São Paulo, denominated herein as EA (Enterprise A), EB, EC, ED, EE.

4.1 General Characterization of the Companies

The headcount of each one of all the companies under study had, between August 2005 and January 2006, of more than 500 employees, the largest one having 2000 employees and less than 600 the smallest one. Three companies out of the five, exhibited total sales above one hundred million Reais; it was not possible to establish a direct relationship between total sales and head count, since the smallest company presented one of the highest total sales.

As regards company administration, a trend was observed showing the migration from family to professional style; currently, two companies are in the transitional stage, one has already professionalized its administration and two are still family run.

Four out of the five subject companies are certified in conformance with ISO 9001, what evidences their interest to meet stringent requirements and increase their export operations, since the export business contribution is fairly low in all the companies but one, whose export contribution to total sales is 50%. However, the leading customers of such company are developing countries, not very stringent as regards quality and advanced technologies. Chart 4.1 summarizes the information.

Characteristic analyzed	Company EA	Company EB	Company EC	Company ED	Company EE
Management style	Family	Family	Professional	Transition (from family to professional)	Transition (from family to professional)
Head count	2000	1600	500 thru 700	900	500 thru 600
Manufacturing sites	2	1	2	1	2
Annual total sales (Million Reais)	Above 100	75 - 100	30 - 50	Above 100	Above 100
New product sales contribution	20 - 40%	50 - 60%	20 - 30%	20 - 30%	20 - 40%
Export business contribution	30%	30%	50%	35%	15%
Certifications (*)	ISO 9001	ISO 9001	No	ISO 9001	ISO 9001

Chart 4.1 General Characterization of the companies under study

4.2 The Main Problems Encountered by Companies during PDP

According to Chart 4.2, it can be seen that problems encountered by companies are peculiar to each one, although they can be reunited in 5 groups: Group 1- quality related problems, Group 2- time related problems (meeting target times), Group3- leadership related problems as well as overall development process management, Group 4- personnel related problems and Group 5- finance problems. Thru this grouping, it is observable that most difficulties relate to process management.

The variables related to development time are also quite critical, due to delay in new products launch or due do difficulties in meeting established targets or deadlines. Companies B and C face problems due to the frequent need of changes in the original project, which is also a time related problem, because changes end up delaying the running project.

	<i>Problems</i>	<i>E A</i>	<i>EB</i>	<i>EC</i>	<i>ED</i>	<i>EE</i>	<i>Frequency</i>
Group 1	Developed product quality	✓	-	-	-	-	1
Group 2	Delay to develop new products	✓	✓	-	-	-	2
	Difficulties to meet deadlines	✓	-	-	-	✓	2
Group 3	Lack of periodic reviews along PDP	-	✓	-	-	-	1
	Frequent changes in the original project	-	✓	✓	-	-	2
	Slow PDP information system	-	-	-	-	✓	1
	Lack of integration between product project and process project	-	-	-	-	✓	1
Group 4	People management	-	-	-	-	✓	1
	Small development teams	-	-	-	-	✓	1
	Difficult communication amongst engineering and other company sectors	-	-	-	-	✓	1
Group 5	High development costs	-	-	✓	-	-	1
	Lack of financial resources	-	-	-	✓	-	1

Chart 4.2 Main problems as stated by companies

If compared to other industrial sectors, the new product development time spent by MIAs is extremely short, however, as previously discussed, that variable is vital for products success. When a new product launch delay occurs, besides the problem of having to wait until the next harvest, some worsening factors exist. A competitor may launch a similar product, heavy financial loss for the delayed company, since those equipments have a long useful life and the customer who purchased from a competitor most likely will purchase a similar one in no less than 10 years.

Development costs are also a problem for companies EC and ED. For EC the development cost is high, as long as for ED the problem is the lack of financial resources to invest in new projects.

EE faces many people management problems as well as small development teams. Beyond that, the company has problems managing the information flow amongst Engineering (responsible for PDP) and other company areas.

Although separately grouped, problems interrelate. For example, delays due to changes in the original project are frequent. Companies face difficulties to meet deadlines due to the small project teams, communication difficulties amongst departments and lack of quick response of the information systems. Indications exist showing that, by solving any of those problems, there will be a contribution to solve the others.

5 Conclusions

By studying the various problems which were detected, the companies concern to hire employees with technical knowledge is noticeable, what can be one of the causes of PDP management related problems (Grupo 3). Hiring professionals with solid PDP background would facilitate the solution of such problems due to their wide vision of PDP and not only isolate activities, ; this fact would also allow the early identification of most critical functions and activities as well as a better integration amongst PDP involved areas.

Time related problems, together with changes in original projects, are likely to provoke misunderstandings between the PDP team/department and Commercial area. In such situation it is ideal that the companies foresee clients' future needs ahead of time, thus preventing projects with moving targets over time. Also, the lack of integration between product project and process project may result in faulty prototypes or a manufacture incapable to produce the new product, thus causing further delays. Carrying out tests and project validation, involving both product and process, emerge as an alternative prior to the actual scale production, which will help avoid customers dissatisfaction and complaints about product performance.

Starting from the problems identification and their categories, it is important that companies may concentrate themselves on their respective causes to prevent them, since all the identified difficulties result in delays or even in products performance lower than expected.

In more complex situations, the new product project and its development are likely to provoke conflicts amongst the different company areas, thus harming the overall PDP. The ideal situation, during the PDP, is to have clear project objectives, shared throughout the organization and articulated with the market needs and the company's strategy, thus facilitating the early solution of problems in all the hierarchical levels.

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