A Process Model for New Product Development: A Multiple Case Study of Iranian Food Industry Companies

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Abstract: Regarding the high importance of NPD in companies' success and worrying rate of failure of product development projects in world and Iran, and this research aims to introduce a model for effective product development process in Iranian food processing companies. In this research, by using multiple case study method and pluralistic approach, three food-processing companies in Iran have been chosen and studied. In each company, by using different methods like semi-structured interviews, recommendatory NPD process model have been defined. Then, emerged recommendatory models of all three companies have been intra-case analyzed and at last compared with existing models of literature. The result of this research is a 12-step model, which some steps (e.g. organizing NPD team, taking legal permissions of new product, distribution channel training, and participative goal setting with distribution channel agents) are unique in comparison with existing models of literature. This is resulted because of the varied conditions of the studied companies. Therefore, recommendatory model of this research is an appropriate guideline for execution of NPD process and helps Iranian organizations to solve one of their important problems.
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Introduction

The execution of product development programs and the successful introduction of new products lend themselves more and more difficult year after year. According to new studies conducted by the Product Development and Management Association, some 40% of new products end up as failures (Adams, 2004). The success rate of new products, as well, is worryingly low. The failure rate of new packaged products (most of which considered as development of manufacturing lines) also stands at about 80 percent. Awa, 2010, holds the idea that new products and financial services, such as; credit cards, insurance programs, and services also face the same failure rates. Cooper and Kleinschmidt, 1991, also underline that some 75 percent of new products are doomed to failure right at the beginning. Havaldar (2005). 154, also has found out that some 30-55 percent of new industrial products and some 75 percent of new consumer products will be marked as failure. Balachandra, 1997, points out that in 1991 over 90 percent of new products did not achieve their objectives. The issue of new products failure also applies to Fast Moving Consumer Goods (FMCG) in Iran, particularly to Food Fast Moving Consumer Goods (FFMCG) and processed foodstuff. For instance, some 90 percent of new products of understudy companies do not achieve their sales targets. Consequently, the issue has been chosen as the main topic in the present study. In the 1990s the rate of new products that filled supermarket shelves grew by 59% and the trend is continuing with even a faster pace (Sarah, 1997). Although there exists a solid sum of theoretical issues on the topic of the research, the chosen topic signifies its importance due to the failure rate of over 90 percent of Product Development Programs, the doubling of New Products growth rate in every five years, and bearing in mind the lack of a comprehensive execution model of product development for active food companies in Iran. The overall objective of the present study is to provide a process model, which fits the understudy enterprises' requirements for the successful execution of product development programs. The present study also enjoys having methodological innovation. On the one hand, no study has ever been conducted in Iran on the issue of Consumer Goods Development using multiple case approaches. On the other hand, little research has addressed the issue through pluralism approaches to reasoning (In the present study, use has been made of pluralism methods for reasoning). Scientific contribution of this research is to provide a rather different model (applicable and suitable for Iranian organizations' requirements) compared to other models in the theoretical literature, which have been carried out through multiple case studies. This is mainly because of the fact that the model in the present study is based on practical results of product development processes, meaning that the model presented in the latter parts of the paper is based on

surveys, in-depth research, and the involvement of the researcher in the implementation processes. Consequently, issues such as lack of practicality and applicability (Hoffman et al., 2010, Cooper & Kleinschmidt, 1995) would not apply to the model of the present study.

Theoretical Framework

Griffin (1997) quotes the Product Development and Management Association (PDMA) and defines new product development as a set of tasks, processes and defined actions that materialize the sales and services objectives of a company, through converting its naturally premature (initial) ideas. Product development process is a complex sequence of activities to achieve the pre-determined goals. These activities will result in an immediate end to achieve the overall result (Drejer & Gudmundsson, 2002). Product development is a series of activities that begin with the perception of a market opportunity and end with the production and sale of the product (Hoffman et al., 2010). The most common and the most popular model of product development, which has been the source of many future models, is the base model of product development by Booz and Hamilton (1982). This model, which is still vastly in use, can be found in many sales and marketing textbooks and envisions the execution of product development process as a series of sequences of processes, through which a new product in the form of an initial idea develops to a final commercial objective (Figure 1).

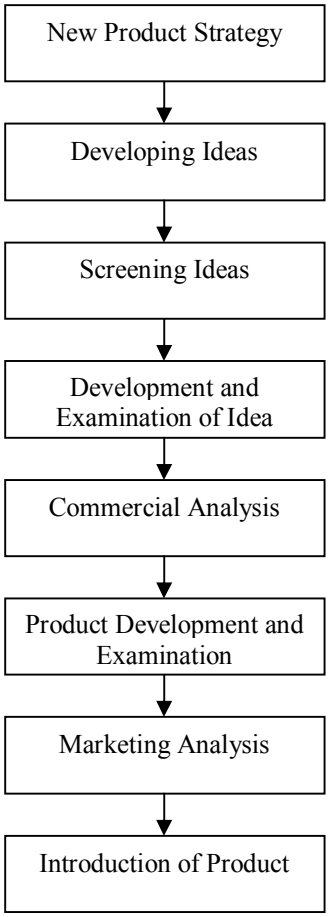

Figure 1: Product-based Development Model (Booz and Hamilton, 1982)

Table 1: Comparison of theoretical models in the product development process and process steps

Sources / Processes	(Booz & Hamilton, 1982)	(Cooper & Kleinschmidt,1991)	(Bessant & Fransis, 1997)	(Cooper, 2000)	(Ulrish & Eppinger, 2004)	(Mowry, 2007)	(Costa, 2007)	(Crawford & Benedetto, 2007)	(Kumar, 2009)	(Awa, 2010)
Strategy Identification	✓		✓		✓					
Idea navigation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Feasibility studies and screening ideas	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concept Development and Testing	✓	✓		✓	✓	✓	✓	✓		
Presentation and edition of formulas	✓				✓	✓	✓		✓	✓
Market research and Determination of sales goals			✓	✓				✓	✓	✓
Financial feasibility	✓	✓		✓				✓	✓	✓
Trial production		✓	✓	✓	✓	✓	✓	✓	✓	✓
Identification of marketing mix										✓
Real test of market	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sales and controlling factors of marketing mix	✓		✓	✓	✓	✓	✓	✓	✓	✓

Although such models are modified though inserting Interalia detailed sub-stages, Inter Departmental Functions, and decision points; (e.g. Mowry, 2007 and Cooper, 2000); it seems that there are still some problems, which will be embarked on after identifying key steps of the common product development models in a single table, and the criticisms reflected against them will also be elaborated.

As illustrated, in most of the presented patterns, attention has been paid to the processes of idea navigation, feasibility studies and screening ideas, concept development and testing, presentation and edition of formulas, market research and determination of sales goals, financial feasibility, trial production, real test of market, sales and controlling factors of the marketing mix. It seems that most of the studied patterns have problems. These problems are fruits of feedback loops, linear conceptualization of the process, lack of attention to simultaneous processes and successive conceptualization of process, slight attention to the early stages, lack of attention to external stakeholders such as suppliers, lack of specificity of the product development process in different contexts, and attempts to provide a universal pattern, as well as not considering constraints and legal requirements, and lack of attention to the activities coordinators.

Considering the nobility of local research based on the social constructionist approach and postmodernism (Smith et al., 2002) and considering the fact that the approach of the case study method is a constructionist one (Smith et al, 2002), and that the objective of the researcher is to provide an indigenous model for product development; in this part of the study a review of the related literature on the influencing factors and recovery strategies in Iran will be presented.With regard to the research problem (high failure rate of product development projects), and the lack of research and product development models to suit food industry companies; the main research question is as to follows. How should be the product development process in the studied companies (the prescriptive model)?

Research Method

In the present study, the case study method is utilized since in order to find answers to the research question, the complex process of product development of several organizations needs to be studied more deeply. Then, the process improvement solutions should be discovered in the organizations (presenting proposed model). The case study method should also be utilized in order to delve into a comprehensive, accurate, and deep study of product development, which is not separable and distinct from its context. This is mainly because of the fact that this method is the best way to study the subject in depth (Eisenhardt, 1989) and would yet realize the theory-building purposes (Gersik, 1988, Harris & Sutton, 1986; Mc Naab, 2008; Yen, 2008) and would help present the proposed model. On the other hand, to do the present research in multiple organizations and then to combine the results of the organizations (cases) and to provide a general conclusion, the multiple case study approach (Yin, 2002) should be used. Therefore, the present study is a descriptive and prescriptive one in purpose and a case study one in method since in the present study, using a case study, a model is to be presented after exploring ways to improve the product development process.

In this section of the paper, the research stages are elaborated on in order. The site selection comes first. The site selection stage (case study) was done with regards to the potential role of site to gather information, logistical considerations such as proximity and availability, and level of experience. General information of the three companies in this study, which were selected according to the above-mentioned criteria, are summarized in Table II. The study was conducted in the period of the years of 2009, 2010, 2011, and 2012, when the researcher was in charge of the product development process and involved in the implementation processes in all three companies; in the years 2009, 2010, and the first half of 2011in Kadbanoo Company and the second half of 2011 and 2012 in Ramak dairy and Ramak Bita ice cream companies.

Table 2: Studied Companies' General Information

Company	Trade Mark	Age (Years)	No. of Personnel	Ranking in Industry based on sales	No. of Products
Kadbanoo (Delpazir)	Delpazir	20	190	3rd	48
Ramak Dairies	Ramak	16	350	6th	62
Ramak Bita Ice Cream	Ramak Bita	4	180	5th	58

Then, the process of product development and strategies for improvement in each of the three companies are identified separately. In data collection, in order to improve the accuracy of the data, the researcher used the Triangulation approach. Data collection methods to describe the current situations and to find ways to improve the process and then to present proposed model in each of the companies surveyed (cases) are: monitoring participatory process, interviewing with managers involved in the product development process, and reviewing related documents

and written texts. Targeted sampling with theoretical saturation criterion was used to interview managers and experts. The interviewees' data are presented in Table 3.

Table 3: Information of Surveyed Individuals

Position	No.	Average work experience	Holder of Bachelors' Degree	Holder of Masters' Degree and Higher
Manager	14	5	4	10
Deputy and General Manager	6	10	3	3

In order to document data collection and to increase the reliability of data, use have been made of audio documenting devices (in the case of data obtained from interviews); visual documenting cameras and camcorders (in the case of data obtained from observation); and written documentation of emails, letters and other documents (in the case of data obtained from written documents).

To analyze data from interviews and documents, theme analysis (Braun & Clarke, 2006) is used. Accordingly, the key points contained in the text of the interviews, documentation reviews, and the researcher's reports of observations have been encoded. Then similar codes were combined into themes. Codes indicate key points, and themes of common code in each of the companies are shown in the tables four to six.

Table 4: Codes and Themes' Table of Offered Product Development Process in Kadbanoo Co.

Theme Code	Theme	Codes
KPP1[1]	Strategy Determination and	PB14,
KPP2	Establishing a Responsible Committee	PB15, PC19,
KPP3	More Accurate Diagnostic and Screening of Ideas	PE13, PE19, PA18, PE20,
KPP4	Strengthening market research	PA15, PB16, PE19, PF19, PA19, PB20, PE21, Pe23,
KPP5	Market Analysis Formulation Technology Transfer and	PA16, PB17,
KPP6	Comprehensive and Parallel Feasibility	PA17, PD11, PB19, PD14,
KPP7	Experimental Mass Production	PB17, PA20, PE24,
KPP8	Goal Setting and Training Vendors	PF22, PE1, PB18, PB21, PC18, PD15,
KPP9	Promotion	PD9, PE16, PE18, PF21, PF24, PD16, PE26,
KPP10	Real Test of Market	PA20, PC21, PE25,
KPP12	Increased coordination	PE14, PE15, PE19, PF23, PF25, PE22,
KPP13	Acceleration	PC20, PD13,

Table 5: Codes and Themes' Table of Offered Product Development Process in Ramak Bita Co.

Theme Code	Theme	Codes
RBPP1[2]	Identification Of Strategy And Position	PC11, PD10,
RBPP2	Establishing A Responsible Committee	PC11,
RBPP3	Identifying Ideas And Feasibility Tests	PB15, PD11, PC12, PA12, PB16, PC11, PA16,
RBPP4	Market Research	PB14, PD13, PA14, PC14, PA15, PB18, PC13, PD20,
RBPP5	Sales Goals And Training Sales Team	PD7, PC9, PB21,
RBPP6	Financial Feasibility	PC14, PD19,
RBPP7	Experimental Mass Production	PC11, PD16,
RBPP8	Real Test Of Market	PB22,
RBPP9	Mixed Strategy Of Pressure	PB17, PC11, PD17,
RBPP10	Monitoring The Marketing Mix	PA17, PC11,
RBPP11	State Legal Constraints	PB6, PB9, PB12, PC4, PC7, PE14,
RBPP12	Cost Reduction Process	PA10, PC11,
RBPP13	Acceleration Of Process	PA11, PC11,

Table 6: Codes and Themes' Table of Offered Product Development Process in Ramak Co.

Theme Code	Theme	Codes
RPP1[3]	Strategy Determination	PA20, PB18, PC11, PD13,
RPP2	New product team	
RPP3	Identifying Ideas And Feasibility Tests	PA21, PB16, PB17, PB19, PD14, PC16, PE28, PA23, PB21, PC18, PE21,
RPP4	Full Market Research	PA22, PB15, PD16, PC17,
RPP5	Technology Transfer And Market Analysis	PA14, PC13, PE22,
RPP6	Experimental Mass Production	PA26, PB24, PD19, PD20, PC21,
RPP7	Setting Sales Objectives And Training Sales Team	PD21, PE4,
RPP8	Mixed Strategy Of Pressure	PA25, PB23, PC20, PE5, PE23,
RPP9	Sales Tracking	PA19, PB18, PC15, PD22,
RPP10	Cost Reduction Process	PA19, PB14, PB18,

[1] Kadbanoo process phase 1
[2] Ramk Bita process phase 1
[3] Ramak process phase 1

RPP11	Acceleration Of Process	PA18, PA19, PB14,
RPP12	Increasing Coordination	PA27, PB14, PB25, PC14, PD15, PE24, PE25, PC22,
RPP13	Flexibility In Distributed Systems	PA19, PB18,

After the creation of the themes, the themes' transformation into the process model of each company was done based on the general view of the researcher. The foregoing analysis was done separately for each of the three understudy companies.

The resulting patterns of each of the cases (companies), which are presented in tables four to six, are analyzed and their similarities and differences have been identified. Bearing in mind the vast similarities of the proposed patterns of the three firms (tables four to six); a prototype model of product development process for the three companies was extracted and has been presented in the Chart 2 of the present study in the findings section. Ultimately, the model in Chart 2 (the final proposed model of the research), is analyzed and compared with existing theoretical models at the Conclusion.

Results

The final proposed model will be presented as follows (based on the pictorial model II). Theme codes relevant to each stage of the proposed process are presented at the end of each period.

The first step is to determine and announce the grand strategy of the company, the target market of the company, and forming a product development team (KPP1, RPP1, RBPP1, KPP2, RPP2, RBPP2). second step is finding the idea through analyzing the competitors, consumers' feedback, and other inside and outside resources (KPP3, KPP6, RPP3, RBPP3). The third step is the feasibility study and screening of ideas by a task team to develop products according to criteria such as: Compatibility with marketing strategy (by the marketing management); Compatibility with the company's ability to supply raw materials and packaging materials (by business management in 15 days); Compatibility with the production facilities of the company (by production management in 30 days for new products requiring new production lines and 7 days for new products that will be produced with existing production facilities); Compatibility with distribution and sales facilities of the company (by sales management); Compliance with the terms and legal restrictions (by the Quality Control Management in 7 days); Compatibility with the company's core capabilities (by Product Development Team) (KPP3, RPP3, RBPP3). The marketing department should then conduct researches focusing on the analysis of competitors, potential market size, market growth potential, and buyers' intention to buy that new product (concept testing). If a product is quite new, market research cannot be done through the mentioned modes, and merely the companies that have been modeled can be used for comparison purposes, and further judgments on the future of the product in the Iranian market can be made only based on revised formula (KPP4, RPP4, RBPP4). Then if the market assessment is positive, Research and Development Unit (following reviewing standard brochures) would embark on formulation and preparation of test samples within the standard brochure or any formula that it considers appropriate (in cases where a standard brochure is nonexistent). The prototype formula, then, will be revised in the Research and Development Unit based on customers' feedback. Consequently, the modified formula would be returned to the marketing department once again for yet another test to be performed on it outside the company. In case of disapproval of the sample, the cycle continues (KPP5, RPP5).

Following the completion of the formulation process, sales targets based on more accurate market estimates of future demand will be determined (RBPP5, RPP7) in the sixth stage. In the seventh stage, the financial unit will be in charge of financial feasibility processes and providing a profit and loss forecast (based on quoted market prices and the amount of sales, and B.O.M. [Body of material] introduced by the Research and development Unit) within ten days (KPP6, RBPP6). After these steps, it is possible to modify the formula, re-asses the feasibility, halt the project or to keep it running based on the outcomes of the financial feasibility process.

After the mentioned steps and if the production of the product is financially and market-wise positive, various processes are to be implemented in parallel to successfully ensure that the perquisites of production are met: the monitoring unit takes on the task of acquiring necessary authorizations of production such as production permit in 30 days, after taking many product designs into consideration, the marketing unit is set to select the proper product design and present it to the commercial unit (After acquiring the necessary authorizations). The commercial unit is assigned to prepare and arrange the necessary packing items (in accordance with the presented design from the marketing department), the necessary advertising material (according to the demands made by the marketing department), and the production material (based on the BOM presented by the department of research and development) all of which are to be ready in 90 days if imported and in 40 days if local, the technical department of production takes on the task of evaluating the possibility of production and organizing the production facility in 90 days (only if

production does not require the purchase of any newly innovated production technology, because if a need of new machinery and technology is determined in the evaluation phase, the project is considered a failure since it does not meet the factors of possibility of production) (KPP6, RBPP6). When the production facility is prepared, in order to identify the challenging problems into the open and to successfully troubleshoot them, it is time for the primary experimental production (KPP7, RBPP7).

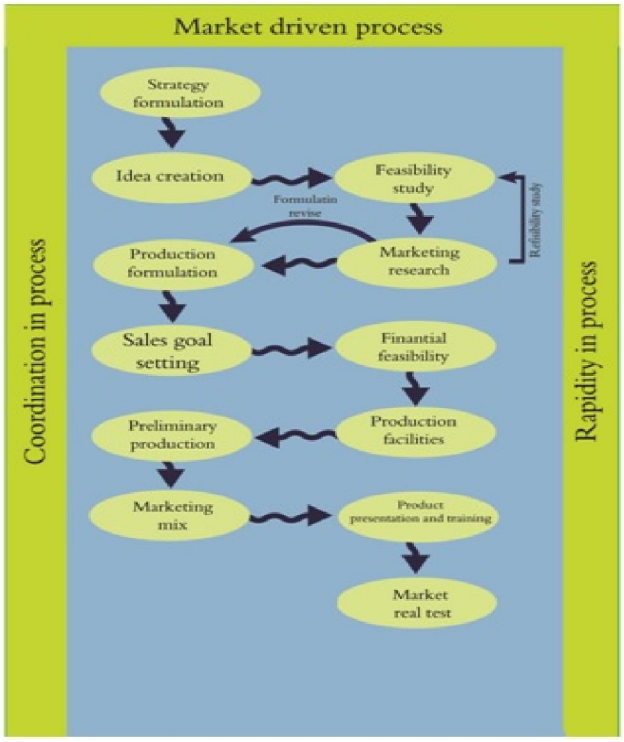

Figure 2: The Production Model (pattern) for Developing the Suggested Product

After the steps explained above and at the 10th stage, the marketing mix which are based on the Push Strategy such as the range of retailer interest, reseller commission, etc. are defined to realize the selling point (RBPP8, RPP9). Then at the 11th stage, the diverse marketing elements are introduced to the agents of the distribution network, and the sales target is defined for all branches, resellers, and company reps in categories. In addition one week before the product hits stores, sales team are trained (KPP8, RPP7, KPP8, RPP7). At the 12th stage, massive production is started along with testing the real market and introducing the market in a small town or district. If necessary, product is enhanced or even its production is fully terminated (KPP10, RBPP8).

As can be seen, the proposed product development model is under the positive influence of three process: parallel activities, rapid process (KPP13, RBPP13, and RPP11), and coordination in the implementation of the process (KPP12, RBPP14, and RPP12).

Discussion and Conclusion

In this chapter of the article, the proposed model of the scholar is compared to patterns in the theoretical fundamentals (table 1). The academic assistance of this research is the different pattern it presents compared to the available patterns in the theoretical fundamentals (table 1); differences which are mostly due to the variety of circumstances of the companies taken into account. It is worth noting that the applied proposal of the scholar is in fact the proposed model. Following the presentation of the items above, the restrictions and limitations, and the suggestions for the future researches are presented.

As the first step in the proposed model and some similar common patterns, strategy is defined as a directing agent. Then according to the proposed model, a development team is formed (KPP1, RPP1, RBPP1, KPP2, RPP2, RBPP2). The reason of the emphasis put on this stage by the proposed model, is the dispersed and single-tasked decision making, mostly done by the board of directors regarding screening of ideas and directing the process. There has been no mention of this subject in the previous patterns, but forming such group may have been their default. At the second stage of the proposed model, there is strong emphasis on generating ideas from different sources, especially foreign competitors (KPP3, KPP6, RPP3, and RBPP3). It is due to the fact that the strategic style of the reviewed companies is structured. But there is no mention of imitation of and taking ideas from competitors, because the strategic style proposed by these patterns are rather offensive and confrontational. The proposed model in this research mentions evaluation and screening of ideas by the product development team (stage three) in accordance with several internal standards (KPP3, RPP3, and RBPP3). But the present theoretical patterns introduce external standards of research as one of the most important measures of the stage above. Since market research is time-consuming and costly, and to define the selling point of the company, the two following topics discussed had better be implements for ideas which have been approved in the evaluation and screening stage in accordance with internal standards. Stage four is market research, centered on the analysis of competitors and market demand (KPP4, RPP4, and RBPP4).

Stage five is providing, testing and modifying the formulations which is also mentioned in the reviewed patterns (KPP5, RPP5). The topics of technology transfer and sample imitation are subjects which are discussed in this model, unlike in the theoretical patterns. The reason for this difference, is

the weakness among Iranian firms regarding the mentioned phase and their copycat strategy which makes this a very important stage. At the stage of defining the selling target (stage six), which is the most sensitive stage of all, the demands for the newly produced product is determined (based of the approved formula) (RBPP5, RPP7). The estimation of demand shows the required ingredients, packaging materials, and the necessary production line. This topic is mentioned in the theoretical patterns, but under the frame of the market research unit or the commercial analysis. In the financial evaluation stage, the amount of interest, benefit, or loss is estimated and the formulation is amend if necessary, or even the whole process may be terminated (KPP6, RBPP6).

In the proposed model, stage eight, which is implementing the required preparations, introduces three activities: acquiring statutory licenses, package design (to prevent the new product idea from being leaked, it is beneficial to put of getting the barcode for your product to the last week before commencing production, since your competitors can trace the code on barcode association website and get hold of your ideas), and providing production and packaging materials. These activities are not mentioned in theoretical patterns. The reason why it is mention in this model is the ongoing problems of the reviewed companies. Because acquiring the statutory licenses and authorizations, and providing the production and packaging materials are a lot more time-consuming and costly now due to the increasing sanction) (KPP6, RBPP6). Next stage is experimental production. This stage, is a very important one mentioned in the proposed model and in the theoretical patterns. This is where production problems, obstacles and challenges are identified and amended (KPP7, RBPP7).

At the 10^{th} stage, the diverse marketing with the approach of the Push strategy is emphasized due to lack of Attention towards brand oriented marketing among Iranian consumers compared to western countries, ratio of new products in the introduction phase, and the presence of power in the hands of distribution network and resellers (RBPP8, RPP9), while due to the market being competitive and the presence of brand-oriented market and power being in the hands of the consumers, a diverse marketing with the approach of Tension strategy is emphasized in the theoretical patterns. In the proposed model, stage 11 focuses on introducing the elements to the distribution network, setting their various objectives, and training them, because distribution network holds great deal of importance in Iran. But since there is no such condition in western countries, where all this has been generated from, it has not been starred. On the other hand, It can be claimed that according to organization theory, strategic management and chapter dedication to the topic of training in strategic formation discussions, training the sales team is a must, when aiming towards successful entrance of product into the market. The reviewed patterns have not mentioned anything regarding this aspect, and the reason why it is discussed here in this model is poor sellers in Iran (KPP8, RPP7, KPP8, RPP7). Stage 12, is testing the real market and amending the elements of the diverse marketing which is, due to poor marketing research in Iran and difficulties of proper estimation of market demands (due to lack of transparency in responses), the best method of assessing the real demand of the market (what needs to be done is providing enough materials for the experimental period e.g., 3 months, and measuring the consumption period e.g., 6 months). Due to the mentioned above, this stage is emphasized in the proposed model. It is also mentioned in some theoretical patterns (KPP10, RBPP8).

Generally, the specific restrictions regarding this research were: time limit, (time needed for case study research is more, especially if the research is multi-case study), impossibility of teaching the model to all the companies active in the field of food industry due to the possible differences among them with the reviewed organizations.

According to the subject and the possible uncertainties, it is suggested that scholars have deeper looks into following subjects: heterogeneous diversification strategy pattern, product development process improvement pattern, discourse analysis of new product development in consuming product industry in Iran, market demand estimation pattern for newly introduced products, product development pattern for depression period, the influence of new product development on financial rate of companies, relation between expansion of capillary distribution network and wholesale network on new product success, the influence of commission system on sales in capillary distribution network, selecting proper marketing strategy for introducing a new product in Iranian market, evaluation of new product development in Iran, providing exclusive product development pattern for industry, in accordance with each industry's uniqueness.

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