



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 5)

Available online at: www.ijariit.com

The concept of operations research in product introduction planning

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ABSTRACT

The following research paper is an overview of how research and development is a critical part of the analysis for each and every stage of the new product planning process and how it helps the companies in finding the defaults in the product, the demand of the product or the areas where the company can do better. R&D is helpful right from the idea or the product to its launch. The company can control its risk factor with the product. And also do the market analysis of the product. There can be problem allocating the product to its deserving customers with the help of operations research. There can be analysis (critical path analysis) done to find different alternatives if the current process is not feasible. The drawbacks of the R&D can be seen on the product when even after heavy investment, the product does not get the expected hit in the market.

Keywords— Operations research, New product planning, Critical path analysis

1. INTRODUCTION

Considering product lifecycle phrases, income from already existing products will wane over an interval of time. Business revenues are anticipated to grow with expounded growth targets. This situation of declining revenue from existing products and expected revenue increase lined up to growth targets creates a gap to be filled by new product introduction. (HA Simon)

Depending on the nature of the product, market dynamics, regulatory demands and requirements, and other economic and social limitations, the product introduction procedure can differ.

Product Introduction Planning is the launch of a new product into the marketplace and occurs at the termination of a successful product development model.

Every year 30,000 new consumer products are launched from which 95% of them fail to make good business in the market even after rigorous research and development and thorough market analysis.

The company with the highest expenditure on R&D is Volkswagen with approximately \$13.5 billion, which is almost 5.2% of their revenue, Samsung with \$13.4 billion, which is 6.4% of their revenue followed by Intel with \$10.6 billion. (HA Simon)

Audi India plans a new product launch for a comeback to regain a leadership position in a luxury car segment. Audi India will soon launch products with a new body type which required extensive research and development. Volkswagen is also planning to launch its first electric vehicle in India. (Edgar A. Pessemier)

Research and development have now become an integral part for any company to make its position against its competitors. In that specifically, when any company is about to launch a new product into the market. The new projects that have been included in this sector are as follows:

- Market landscape assessment and opportunity sizing.
- Global disease strategy at corporate, BU and asset level strategy.
- Investor deck development. (HA Simon)

The need for research and development is so necessary today, as it provides a platform for the new product to come in and compete with the other market giants represented by their products.

2. USING ASSIGNMENT PROBLEM

Here we are considering that our company which belongs to the FMCG sector wants to launch 4 new products into the market after thorough research and development, after analyzing the market and the competitors, targeting the right customers, devising unique value proposition. The 4 new products are Tetra Packs, Coffee, Chips, and Medicines. We have divided the market into segments based on their age such as Kids (from 5-13), Teenagers (from 13-19), Adults (from 19-50) and senior citizens (above 50). We have solved the Assignment Problem through the Simplex Linear Programming method using solver on excel.

	A	B	C	D	E	F	G	H
1			Kids	Teenagers	Adults	Senior Citizens		
2		Tetra Pack	1	1	3	0		
3		Coffee/Tea	0	3	1	2		
4		Chips	2	2	4	0		
5		Medicines	3	4	2	1		
6								
7			0	1	0	0	1	1
8			0	0	1	0	1	1
9			1	0	0	0	1	1
10			0	0	0	1	1	1
11			1	1	1	1		
12			1	1	1	1		

Fig. 1: Simplex Linear Programming method using solver on excel

We used the following constraints:

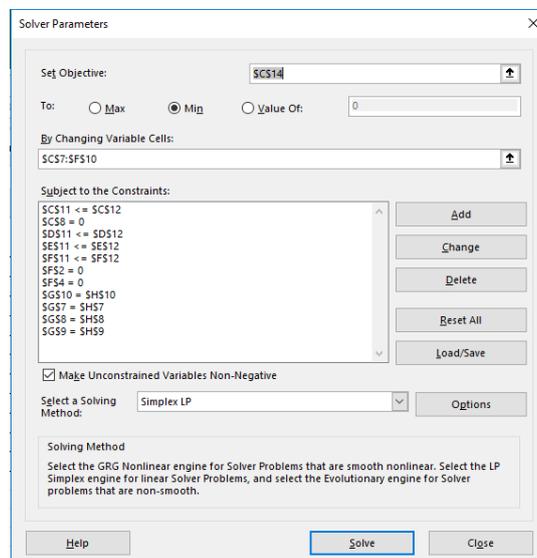


Fig. 2: Constraints used

2.1 Analysis (for the sum)

Hence, here with one of the methods of operations research that is assignment problem sequencing, we were able to allocate the exact market for each and every product that the company deals in. This is one of the ways in which R&D helps in the market analysis for the products. After this, the company finds its competitors in each of this segment and accordingly alters the features of its products.

3. LITERATURE REVIEW

The Research Paper (Julie Ward) starts by introducing Critical Path Analysis, its history and explains the concept and the working of Critical Path Analysis. Further discussion shows that the research paper links Critical Path Analysis with the Research Topic i.e. New Product Planning. (Leigh Lawton)

The author explains the fundamental concepts of stepwise: (JE Kelley Jr - Operations research)

- 1) The Planning Phase: A hypothetical new product venture is illustrated i.e. a detailed discussion on the 63 tasks involved in a new product planning are listed and a diagram is drawn to show how the sequential and parallel tasks are carried out.

- 2) The Scheduling Phase: Followed by the planning phase, the scheduling phase focuses on assigning durations to the tasks illustrated, it helps to compute the total time taken for the completion of the project. The estimation of activity duration is a very important task in CPA.
- 3) The Control Phase: The control phase focuses on identifying areas that need immediate action and thus making the right decision to complete the project with speed and efficiency.

In the end, the research paper points out the significance of CPA in New Product Planning.

4. SIGNIFICANCE

4.1 Need for this research paper

Operations is a kind of science that is used in most of the companies to have a systematic preview of any of the activities of the company. Out of those, new product planning requires a lot of research and development in the same. This project is certainly the analysis of the process of the product planning which starts right from the idea of the product to its launching of the product. This is a long process and it requires heavy investment in the research and development part. This is because there is a lot of weightage given to the analytical tools. (RJ Vokurka - Journal of Operations Management)

This research paper would, therefore, be helpful to any business startup so as to get the idea of the process of production planning, which are the specific areas of loop-holes or where there is a possibility for a company to concentrate more amongst the stages of the planning. They can also analyse the basic strategies and systems to compete with its fellow competitors in terms of their products.

4.2 Need for research and development

The basic need for research and development is to ensure the successful launch of the new product as well as come up with a thorough marketing plan that ensures sustainability of the business and accomplishes its established product related targets. New firms do not understand the importance of research and development until it is too late which leads to a complete product failure, which in turn leads to substantial loss. (Z Griliches - The bell journal of economics)

Research and development are also necessary to gain a competitive advantage over its competitors because failure in an R&D effort increases the pressure to perform. The firm that can successfully leverage its R&D attempts by rendering the efforts in developing new products will find itself ahead of its competitors.

It is also required to provide a platform for creativity and innovation to thrive in an organization because Innovative breakthroughs occur only because of diligent efforts of the R&D function. Perseverant efforts are needed when one is in pursuit of research.

5. METHODOLOGY

The above research paper is qualitative in nature and it is an exploratory paper. This is paper has been made after referring to other research papers of the same topic and the following analysis has been derived pertaining to research and development being used in the new product planning. There is also an assignment sequencing problem that has been added in the paper to conclude how various segments in the market are to be targeted based on the ranks of preferences while introducing new products in the market.

6. ANALYSIS

The main investment of research and development on new product planning is done on formulating the idea for the product as it is the base for any product. Then enters the system of concept development where one builds and analyses the kind of product one wants to build in the market. Then it is the market analysis which is another important job as one has to analyze its competitors, the kinds of products that are available and on the basis of that make the necessary requirements to its own product.

Then it is the risk factor. Every company has to go through some of the other kind of risk so as to launch a product. That risk can be nominal or huge, depends majorly on the market that the company is dealing in. Any product needs to be first tested thoroughly, which involves major R&D investment as the product has to be tested in different situations. Only after there is proper R&D that is done in all the stages, the product is launched into the market. However, from the recent statistics of the market situation only one out of the seven products that are actually a success in the market. Therefore, there is heavy R&D investment that is involved so as to make the product look best amongst all the other products.

An important factor of research and development in this field is the timing at which the product is made, then tested and the launched in the market. Since there is a perfect competition that exists in the market, it is necessary to launch the product at such a point when the needs of the customer from one product are exhausted and he wants to try some new product. Here the “market analyzing” comes into the picture where the needs, consumption and purchasing power of the customer is analyzed.

7. MANAGEMENT OF COSTS IN RESEARCH AND DEVELOPMENT

Target costing is a method which ensures that every component used in the process of R&D, should serve its purpose efficiently and incur the most amount of profit from each component. This target costing is further subdivided into market-driven, product-level and component-level costing. With the help of this process, the decision-makers can evaluate its product by comparing it with the other product. (R Noe) In the case of new technologies, it is necessary to research regarding the costs the product will incur and is it feasible to buy the new technologies and if yes then does it save upon the total cost. When it comes to R&D, it is necessary to calculate the estimates of the costs that are going to be incurred in the future as that will help the company to obtain its waste-free level. While calculating, there are two types of costs that are involved, direct and indirect cost. The impact of direct costs is implied

directly on the product and hence it can be taken care of with the fundamentals. Indirect cost is the one which has to be taken care of as its impact is indirect, it can distort the estimate of the costs. The VIRTUAL PRICE TABLE TOOL plays a very important role in the price-decision process. In order to deal with the saturated markets, the only component that can be dealt with is the price. If the price of the product is relatively cheaper than the other products then it becomes easier to seal the product. For the same concept, we need a virtual table that helps to analyze the market price and to make the necessary changes to the price of the product. In order to be economically efficient, it is necessary for a company to have a tabular but virtual representation of the costs that are involved. (JF Reinganum - Handbook of industrial organization)

8. CRITICAL PATH ANALYSIS (CPA)

Critical Path Analysis is a method that helps you to plan all tasks that must be completed as part of a project. It acts as a base that helps prepare project schedule and determine the minimum time taken to achieve the project goals. How does this benefit the firm?

Critical Path Analysis makes it easier for the firm to identify the tasks that are slowing down the entire process and hence shows the firm the area where they need to take action to get the project back on course. (Yung Wong. Vol. 28)

Key Points (HO Hartley)

- The network can have only one origin node and the terminal node
- Some tasks are dependent on the previous task.
- Diagrams project activities using circles and arrows to show the connection between activities and length of activities
- Series of activities is called path and the longest path is the “Critical Path”
- Helps in the assessment of resources needed to execute the project
- Identifies places where parallel tasks can be carried out

8.1 Working of critical path analysis

8.1.1 Diagram

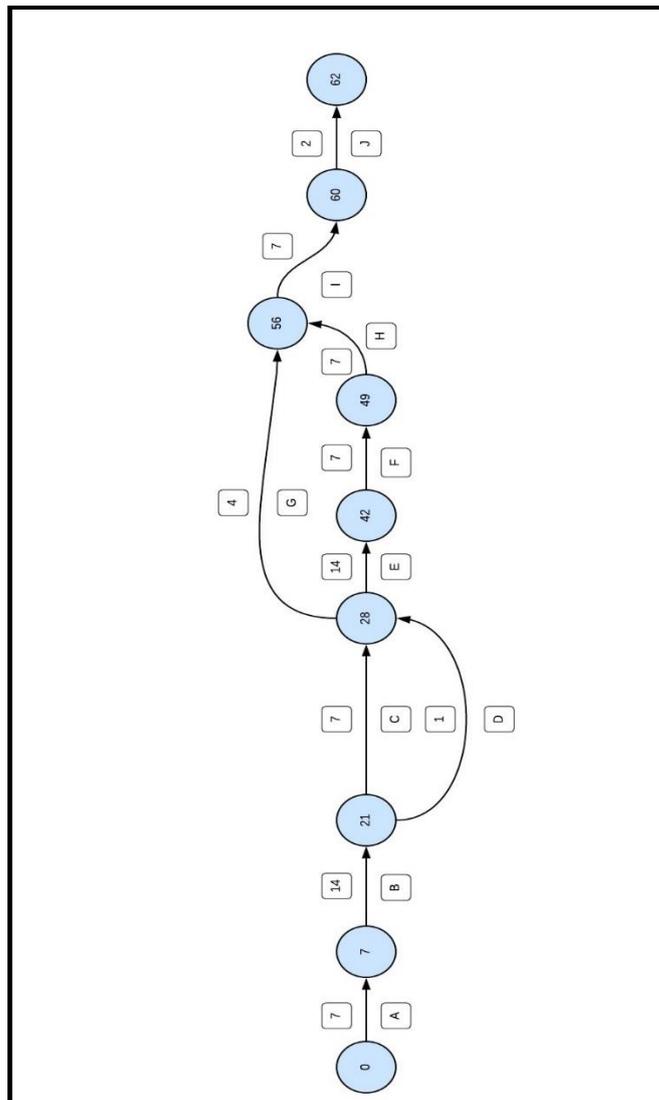


Fig. 3: Working of critical path analysis diagram

The Critical Path for the introduction of a new product will be:
A-B-C-E-F-H-I-J

8.1.2 Task List

Table 1: Task list

Task	Description	Length	Dependant on
A	Brainstorming Session	7 Days	
B	Research & Development	14 Days	A
C	Product Design & Name	7 Days	B
D	CEO/Director Approval	1 day	B
E	Marketing Strategy	14 Days	D & C
F	Sampling	7 Days	E
G	Determine Financial Needs	4 Days	E
H	Consumer Feedback	7 Days	F
I	Development & Feedback	7 Days	H & G
J	Introduction	2 Days	I

8.2 Challenges faced in research and development of a new product launch: (Z Aksin)

- High costs– Companies spend a huge amount of money on their research and development of a product. Pharma companies usually spend around 23% of their revenue on research and development.
- Long-time scales– As research and development take into consideration a lot of factors it is quite time consuming which makes it a slow and time taking process. If companies take a lot of time in research and development they may lose the first mover’s advantage in the market. The needs of the consumers may change during the course of the research and development project.
- Uncertain outcomes– There are always uncertainties about whether the product will meet the customer requirements and expectations. 60% of the research and development projects started by the companies are not completed or are not successful according to the Harvard Business report.

9. CONCLUSION

From all the discussions that have been held, it has been concluded that R&D is an important part of the new product planning process as it is widely used in each and every stage. R&D is the systematic study of all the obstacles that are faced in the planning process. It is the idea to mitigate the losses or to know its drawbacks which are usually faced by the company while selecting the idea for a product or choosing a market segment for its product or even deal with the risk-bearing factors of a product. A proper and systematic research and development plan can help the company to get an overview of the whole plan. And find the possible areas where they need to work more or rather invest more in the R&D plan. It is an important factor in diversifying the risk by finding different alternatives for the same product or its features.

For a start-up, R&D is extensively used in the formulation of the product idea. This is because there is a wide range of products to choose from and there is competition at the same time. For a well-established company, the R&D investment is used more in the market analysis to get more information about the on-going trend in the market. There is a major cost saving for them as they can re-use the design of the product. The cost management is also necessary as this will lead to a systematic allocation of resources according to the operations research program. The from the above research it has been derived that there is an excessive amount of competition in the market and to make your product stand out from the others, there needs to be high amount of investment in the R&D sector for the development of the product as the market is “choosy” and they will buy only that product which is efficient and cheap and fulfills all their requirements.

The main task for the companies is making a standardized product which will be helpful to the whole market as a whole. In this, if there is a proper resource allocation, diversification of risk, proper cost management with the help of operation research techniques, are all the factors which influence the demand of the product.

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