**Identifying and Prioritization Effective Factors in New product development Using ANP & DEMATEL Methods in an Automotive Industry (Saipa industrial company)**

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**Abstract:** In this study try to Identifying and Prioritization Effective Factors in New product development and the impact of these factors on each Using DEMATEL and ANP Methods. To identify critical influential factors, the authors studied and reviewed relevant literature from numerous fields of study associated with the essential issues of new product development. Results of the ANP method shows that Technological factors, Management and Staff factors, Commercialization, factors Organizational factors and Marketing factors are the most important factors in new product development. Results of the DEMATEL method show that Management and Staff have great impact on success of NPD implementation among main aspects. Among criteria of Management and Staff ‚ Motivation in Product development team members has Great Influence on other criteria. Among criteria of Technological factor‚ Production in Time and cost Appropriate has Great Influence on other criteria. Among criteria of marketing factor‚ Focus on the customer has Great Influence on other criteria. Among criteria of Organizational factors ‚ cooperation of Different levels has Great Influence on other criteria. Also ‚ among criteria of Commercialization factor ‚ Product superior to competitors has Great Influence on other criteria.

[Heidarinezhad M, Fathi Hafshejani K, Movahedi M.M. **Identifying and Prioritization Effective Factors in New product development Using ANP & DEMATEL Methods in an Automotive Industry (Saipa industrial company)**. *Nat Sci* 2013;11(11):155-163]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 22

**Keywords:** New product development, Multi-criteria decision making, Analytic Network Process, DEMATEL

**1. Introduction**

Today’s world is characterized by major changes in market and economic conditions, coupled with rapid advances in technologies. Management is often confronted with the dilemma whether or not to invest in a particular stage of the new product development (NPD) program, given market and technology uncertainties surrounding such a decision in current markets, most of all technology-driven or high-tech markets (Moriarty and Kosnik, 1989). The new product development (NPD) and innovation are often recognized as the key processes of competition in a variety of markets (Brown and Eisenhardt, 1995; Drucker, 1999; Hamel and Prahalad, 1994; Jones, 1997; McQuater et al., 1998). Today, markets are generally perceived to be demanding higher quality and higher performing products, in shorter and more predictable development cycle-times and at lower cost (Maffin and Braiden, 2001). NPD is defined as the transformation of a market opportunity and a set of assumptions about product technology into a product available for sale (Krishnan and Ulrich, 2001).

NPD is an interdisciplinary activity (Davila, 2000) including marketing management, organizations, engineering design, operations management and requires contributions from nearly all the functions of an enterprise, whether it is an upgrade (an improvement of an existing product) or a new concept either to the company or to the market (Haque et al., 2000). The core of the NPD process centers on knowledge, it's creation, utilization and the management of knowledge. Within the context of the knowledge-base firm, knowledge has a critical strategic value since it fosters organizational actions and helps the firm establish sustainable competitive advantage. Organizational knowledge is a unique asset and a scarce commodity of an organization. Yet, creating, replicating and transferring knowledge within NPD teams, between NPD teams, and between organizational units is difficult to carry out. Managing knowledge and knowledge creation is a complex task that gives rise to multiple organizing and management issues.

New product development (NPD) can originate from new technology or new market opportunities (Eliashberg et al., 1997). But irrespective of where opportunities originate, when it comes to successful new products it is the consumer who is the ultimate judge (Brown and Eisenhardt, 1995; Cooper and Kleinschmidt, 1987). So, in order to develop successful new products, companies should gain a deep understanding of ‘the voice of the consumer’. Consumer research can be carried out during each of the basic stages of the NPD process: (1) opportunity identification, (2) development, (3) testing, and (4) launch (Suh, 1990; Urban and Hauser, 1993). It is most widely applied during the development, testing and launch stages. Even the most technologically oriented companies use consumer research to verify that consumers will accept a new product when it will be launched at the market. NPD can be considered as an incremental process in which incremental investments provide options to proceed in the process. Moreover, when the R&D stages are completed, the option of market launching the new product is created.

Virtual NPD in SMEs is in its infancy in developing countries, and little research has been done on the introduction of the NPD in SMEs through a virtual team. So, we formed the topic that is somewhat lacking in the literature as a research gap. For many firms innovation is an important business driver. This being the case, managers are pressed to design effective organisational structures to support these activities – which unfortunately – also are widely known to be difficult to organize and manage.

**2. NEW PRODUCT DEVELOPMENT (NPD)**

New product development (NPD) is crucial in various industries for shortening a product’s time to market and for improving the product’s quality. The literature provided a number of definitions for what constitute a new product development. Product development definition is used by different researchers in slightly different ways (Ale Ebrahim et al., 2009). Generally, it is the process that covers product design, pro-duction system design, product introduction processes and start of production (Johansen, 2005). Loch and Kavadias (2008) in the “Handbook of New Product Development Management” define NPD to “consists of the activities of the firm that lead to a stream of new or changed product market offerings over time. This includes the generation of opportunities, their selection and transformation into artifacts (manufactured products) and activities (services) offered to customers and the institutionalization of improvements in the NPD activities themselves”.

New product development is widely recognized as an essential property of the firm (Lam et al., 2007). Life cycle of products is decreasing every year and the customer demand, on the other hand, increased dramatically. With the need to respond quickly to customer requirements, increased complexity of product design and rapidly changing technologies, selecting the right set of NPD is critical to long-term success of the firm (Chen et al., 2008). NPD can be defined as a process including many ‘‘generic decision’’ points, likewise ‘‘decision perspective’’ of Krishnan and Ulrich (2001). In their related work, Urban and Hauser (1993) recommend a five-step decision process for NPD: opportunity identification, design, testing, introduction and life cycle management.

New product development is of high importance for both large and small and medium sized organizations (Pullen, de Weerd-Nederhof et al. 2008).” “Small- and medium sized organizations (SMEs) have a number of typical problems with regard to their innovation process, especially in the shift from the development stages to the commercialization stages (Hanna and Walsh 2002).” Product innovation work is mainly driven by market needs and ultimately external customers. Thus, the product innovation work is primarily effectiveness-driven. Respectively, process innovation work is mainly driven by the needs of production (i.e. internal customers) and can be said to be primarily efficiency-driven. Important to note, these strict definitions and separation of product and process innovation activities do not, however, imply that there cannot be a combination of the two activities and objectives in an innovation project. There are a few investigators done to evaluate NPD performance. For example, (Cooper et al., 2004) discover different measures of NPD performance at the project levels and various plans (Cooper, Edgett et al. 2004). “Measures of the performance of the entire NPD program include the percentage of business profits from new products and the All of these measures show that NPD brings positive growths. With some exceptions, there is general agreement that the new product development (NPD) process is not adequately studied in small and medium enterprises (SMEs) and models and tools specifically focused for these units are lacking. This deficiency is particularly evident where SMEs located in industrial districts are concerned (De Toni and Nassimbeni 2003).”

**3. Effective Factors in New product development**

Proficiency in NPD can contribute to the success of many companies. According to Poolton and Barclay (1998), ‘if companies can improve their effectiveness at launching new products, they can double their bottom line. It’s one of the areas left with the greatest potential for improvement.’ Lynn et al. (1999) developed a model of the determinants of new product development success. Lester’s (1998) study identified a range of potential problems that can derail well-intentioned NPD efforts. By working through these problems, Lester discovered 15 CSFs in five areas of new product development. Poolton and Barclay (1998) identified a set of six variables that have consistently been identified in the literature as being associated with successful NPD. Cooper and Kleinschmidt (1995) studied hundreds of cases to reveal what makes the difference between winners and losers in the process of NPD. He extracted 12 common denominators of successful new product project and seven possible reasons (blockers) offered by managers for why the success factors are invisible and why projects seem to go wrong or are otherwise not well executed.

Based on the previous literature review, we focus on five main aspects including Management and Staff ‚ Technical factors, Marketing factors, Organizational factors and Commercialization. From these main aspects, 21 Effective Factors in New product development are maintained. The classification of those main Criteria and their Sub-Criteria are shown in Table 1.

Table 1. Effective Factors in New product development

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Sub-Criteria** | **Reference** |
| Management and Staff | Senior management commitment | Lynn et al. (1999), Lester (1998), Poolton and Barclay (1998),Cooper (1999) Sun and Wing (2005) |
| Flexibility and responsiveness to change | Cooper (1999) Sun, Poolton and Barclay (1998) |
| Motivation in Product development team members | Poolton and Barclay (1998) |
| Risk in decision-making | Haverila(2012), Poolton and Barclay (1998) |
| Technical factors | Technical capabilities | Cooper (1999) Sun and Wing (2005), Poolton and Barclay (1998) |
| Product Production in Appropriate Time and cost | Cooper (1999),Sun Lynn et al. (1999) and Wing (2005),Lester (1998) |
| Clear definition of the functions of the product | Cooper (1999) Gupta and Wilemon (1990) |
| Technically difficult to replace | Sun Lynn et al. (1999), Lester (1998) |
| Marketing factors | Appropriate Marketing strategy | Lester (1998), Haverila(2012), Ernst Holger (2002) |
| Focus on the customer | Cooper (1999) Sun, Wing (2005), Haverila(2012),Ernst Holger (2002) |
| A growing market | Poolton and Barclay (1998),Ernst Holger (2002) Sharma (2006) |
| Clear definition of the target market | Lester (1998), Cooper (1999) Sun and Wing (2005),Ernst Holger (2002) |
| Organizational factors | Long-term vision | Cooper (1999) Sun and Wing (2005) |
| Different levels of cooperation | Cooper (1999), Haverila(2012), Haverila(2012), Wing (2005) |
| Entrepreneurial culture in the organization | Wing (2005), Poolton and Barclay (1998) |
| The time of replacement | Sun Lynn et al. (1999), Lester (1998) |
| Appropriate timing for the project | Haverila(2012), Cooper (1999) Sun and Wing (2005) |
| Commercialization | Product Scores than competitors | Sun Lynn et al. (1999),Sharma (2006) |
| Resources to implement the project | Lester (1998), Cooper (1999) Sun and Wing (2005) |
| product developed Scores than The old type | Sun Lynn et al. (1999) |
| Generating good ideas by Expert Groups | Wing (2005), Haverila(2012), Sun Lynn et al. (1999), Lester (1998) |

**4. Data analysis**

In this study the ANP method is used to Prioritization Effective Factors in New product development. In this section, an empirical study is presented to illustrate the application of the solution for Prioritization Effective Factors in New product development. The calculations of the supermatrix can be solved by using Microsoft Excel. The overall weights from the limit supermatrix are shown in Table 2. Also, final prioritization of criteria and sub-criteria is shown in table 3. In terms of criteria we have considered four items of the Technical factors, Management and Staff, Commercialization, Organizational factors and Marketing factors and the normalized weights of these factors are 0.269, 0.231, 0.197,0.168 and 0.136 respectively. In other words, Technical factor is the most important factor, followed by Quality, Flexibility and Delivery time. As we discussed, this items includes 21 sub-criteria. The normalized weights of sub-criteria are shown in table 3. Technical capabilities is the most important sub-criteria with weight of 0.0879, followed by Motivation in Product development team members with weight of 0.0851, Resources to implement the project with weight of 0.0743 etc.

**Table 2. The Limited Weighted Super-matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E4 | E3 | E2 | E1 | D5 | D4 | D3 | D2 | D1 | C4 | C3 | C2 | C1 | B4 | B3 | B2 | B1 | A4 | A3 | A2 | A1 | E | D | C | B | A |  |
| 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | A |
| 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | B |
| 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | C |
| 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | D |
| 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | E |
| 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | A1 |
| 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | A2 |
| 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | A3 |
| 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | A4 |
| 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 | B1 |
| 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | B2 |
| 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | B3 |
| 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | B4 |
| 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | C1 |
| 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | C2 |
| 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | C3 |
| 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | C4 |
| 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | D1 |
| 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | D2 |
| 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | D3 |
| 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | D4 |
| 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | D5 |
| 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | E1 |
| 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | E2 |
| 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | E3 |
| 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | E4 |

**Table 3: Final Prioritization of Criteria and Sub-criteria**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria and Sub-criteria** | **Prioritization based on limited weighted super matrix** | **Prioritization of un-weighted** | **Priority** |
| Management and Staff (A) | 0.048 | 0.231 | **2** |
| Technical factors (B) | 0.056 | 0.269 | **1** |
| Marketing factors (C) | 0.028 | 0.136 | **5** |
| Organizational factors (D) | 0.035 | 0.168 | **4** |
| Commercialization (E) | 0.041 | 0.197 | **3** |
| Senior management commitment (A1) | 0.052 | 0.0714 | **4** |
| Flexibility and responsiveness to change (A2) | 0.041 | 0.0563 | **7** |
| Motivation in Product development team members (A3) | 0.062 | 0.0851 | **2** |
| Risk in decision-making (A4) | 0.019 | 0.0261 | **19** |
| Technical capabilities (B1) | 0.065 | 0.0879 | **1** |
| Product Production in Appropriate Time and cost (B2) | 0.024 | 0.0330 | **15** |
| Clear definition of the functions of the product (B3) | 0.021 | 0.0288 | **17** |
| Technically difficult to replace (B4) | 0.032 | 0.0439 | **11** |
| Appropriate Marketing strategy (C1) | 0.017 | 0.0235 | **20** |
| Focus on the customer (C2) | 0.045 | 0.0618 | **6** |
| A growing market (C3) | 0.015 | 0.0207 | **21** |
| Clear definition of the target market (C4) | 0.022 | 0.0302 | **16** |
| Long-term vision (D1) | 0.033 | 0.0454 | **10** |
| Different levels of cooperation (D2) | 0.030 | 0.0412 | **12** |
| Entrepreneurial culture in the organization (D3) | 0.038 | 0.0523 | **8** |
| The time of replacement (D4) | 0.020 | 0.0276 | **18** |
| Appropriate timing for the project (D5) | 0.025 | 0.0344 | **14** |
| Product Scores than competitors (E1) | 0.028 | 0.0386 | **13** |
| Resources to implement the project (E2) | 0.054 | 0.0743 | **3** |
| product developed Scores than The old type (E3) | 0.036 | 0.0495 | **9** |
| Generating good ideas by Expert Groups (E4) | 0.049 | 0.0673 | **5** |

Data collected from the experts was analyzed with the DEMATEL method. The degree of central role (Dx +‏ Rx (in DEMATEL represents the strength of influences both dispatched and received. On the other hand, if (Dx **-** Rx) is positive, then the evaluation criterion x dispatches the influence to other evaluation criteria more than it receives. If (Dx **-** Rx) is negative, the evaluation criterion x receives the influence from other evaluation criteria more than it dispatched. Total relationships matrices are demonstrated in Tables 4 to Table 9.

The results show Management and Staff has great impact on new product development among main aspects.

Table 4. The matrix X (I-X)-1 for Main aspect.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| D-R | D+R | D | Commercialization | Organizational factors | Marketing factors | Technical factors | Management and Staff |  |
| 0.17 | 3.52 | 1.845 | 0.298 | 0.451 | 0.325 | 0.524 | 0.247 | Management and Staff |
| 0.089 | 3.205 | 1.647 | 0.365 | 0.320 | 0.287 | 0.269 | 0.406 | Technical factors |
| -0.016 | 3.71 | 1.847 | 0.513 | 0.418 | 0.365 | 0.243 | 0.308 | Marketing factors |
| 0.063 | 3.449 | 1.756 | 0.330 | 0.257 | 0.524 | 0.206 | 0.439 | Organizational factors |
| -0.306 | 3.386 | 1.54 | 0.340 | 0.247 | 0.362 | 0.316 | 0.275 | Commercialization |
|  |  |  | 1.846 | 1.693 | 1.863 | 1.558 | 1.675 | R |

Among criteria of Management and Staff ‚ Motivation in Product development team members has Great Influence on other criteria.

Table 5.The matrix X (I-X)-1 for factor of Management and Staff

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| D-R | D+R | D | Risk in decision-making | Motivation in Product development team members | Flexibility and responsiveness to change | Senior management commitment |  |
| -0.43 | 2.872 | 1.221 | 0.325 | 0.285 | 0.365 | 0.246 | Senior management commitment |
| 0.17 | 2.822 | 1.496 | 0.360 | 0.297 | 0.298 | 0.541 | Flexibility and responsiveness to change |
| 0.263 | 2.807 | 1.535 | 0.425 | 0.357 | 0.305 | 0.448 | Motivation in Product development team members |
| -0.003 | 2.871 | 1.434 | 0.327 | 0.333 | 0.358 | 0.416 | Risk in decision-making |
|  |  |  | 1.437 | 1.272 | 1.326 | 1.651 | R |

Among criteria of Technical factor ‚ Product Production in Appropriate Time and cost has Great Influence on other criteria.

Table 6. The matrix X (I-X)-1 for Technical factor.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| D-R | D+R | D | Technically difficult to replace | Clear definition of the functions of the product | Product Production in Appropriate Time and cost | Technical capabilities |  |
| -0.099 | 2.937 | 1.419 | 0.358 | 0.384 | 0.426 | 0.251 | Technical capabilities |
| 0.262 | 3.268 | 1.765 | 0.416 | 0.447 | 0.385 | 0.517 | Product Production in Appropriate Time and cost |
| -0.237 | 2.859 | 1.311 | 0.286 | 0.276 | 0.338 | 0.411 | Clear definition of the functions of the product |
| 0.074 | 3.034 | 1.554 | 0.420 | 0.441 | 0.354 | 0.339 | Technically difficult to replace |
|  |  |  | 1.48 | 1.548 | 1.503 | 1.518 | R |

Among criteria of marketing factor ‚ Focus on the customer has Great Influence on other criteria.

Table 7.The matrix X (I-X)-1 for Marketing factor.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | |
| D-R | D+R | D | Clear definition of the target market | A growing market | Focus on the customer | Appropriate Marketing strategy |  |
| -0.261 | 2.887 | 1.313 | 0.307 | 0.325 | 0.256 | 0.425 | Appropriate Marketing strategy |
| 0.268 | 2.348 | 1.308 | 0.412 | 0.259 | 0.222 | 0.415 | Focus on the customer |
| 0.097 | 2.487 | 1.292 | 0.419 | 0.325 | 0.242 | 0.306 | A growing market |
| -0.104 | 2.846 | 1.371 | 0.337 | 0.286 | 0.320 | 0.428 | Clear definition of the target market |
|  |  |  | 1.475 | 1.195 | 1.04 | 1.574 | R |

Among criteria of Organizational factor ‚ Different levels of cooperation has Great Influence on other criteria.

Table 8.The matrix X (I-X)-1 for Organizational factor.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| D-R | D+R | D | Appropriate timing for the project | The time of replacement | Entrepreneurial culture in the organization | Different levels of cooperation | Long-term vision |  |
| -0.166 | 3.244 | 1.539 | 0.514 | 0.336 | 0.327 | 0.236 | 0.126 | Long-term vision |
| 0.327 | 3.335 | 1.831 | 0.264 | 0.367 | 0.417 | 0.357 | 0.426 | Different levels of cooperation |
| -0.072 | 3.636 | 1.782 | 0.418 | 0.369 | 0.227 | 0.327 | 0.441 | Entrepreneurial culture in the organization |
| -0.026 | 3.55 | 1.762 | 0.351 | 0.329 | 0.446 | 0.287 | 0.349 | The time of replacement |
| -0.063 | 3.711 | 1.824 | 0.340 | 0.387 | 0.437 | 0.297 | 0.363 | Appropriate timing for the project |
|  |  |  | 1.887 | 1.788 | 1.854 | 1.504 | 1.705 | R |

Among criteria of Commercialization ‚ Product Scores than competitors has Great Influence on other criteria.

Table 9.The matrix X (I-X)-1 for factor of Commercialization.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| D-R | D+R | D | Generating good ideas by Expert Groups | product developed Scores than The old type | Resources to implement the project | Product Scores than competitors |  |
| 0.193 | 2.513 | 1.353 | 0.452 | 0.325 | 0.451 | 0.125 | Product Scores than competitors |
| -0.139 | 2.569 | 1.215 | 0.339 | 0.225 | 0.236 | 0.415 | Resources to implement the project |
| -0.035 | 2.411 | 1.188 | 0.308 | 0.254 | 0.259 | 0.367 | product developed Scores than The old type |
| -0.019 | 2.853 | 1.417 | 0.337 | 0.419 | 0.408 | 0.253 | Generating good ideas by Expert Groups |
|  |  |  | 1.436 | 1.223 | 1.354 | 1.16 | R |

**6. Conclusion**

In this study try to Identifying and Prioritization Effective Factors in New product development and the impact of these factors on each Using DEMATEL and ANP Methods. Results of the ANP method shows that Technological factors, Management and Staff factors, Commercialization, factors Organizational factors and Marketing factors are the most important factors in new product development. Results of the DEMATEL method show that Management and Staff have great impact on success of NPD implementation among main aspects. Among criteria of Management and Staff ‚ Motivation in Product development team members has Great Influence on other criteria. Among criteria of Technological factor‚ Production in Time and cost Appropriate has Great Influence on other criteria.

Among criteria of marketing factor‚ Focus on the customer has Great Influence on other criteria. Among criteria of Organizational factors ‚ cooperation of Different levels has Great Influence on other criteria. Also‚ among criteria of Commercialization factor ‚ Product superior to competitors has Great Influence on other criteria.

**References**

1. Ale Ebrahim N, Ahmed S, Taha Z (2009). Virtual Teams for New Product Development – An Innovative Experience for R&D Engineers. Eur. J. Educ. Stud. 1: 109-123.
2. Brown, S. L., & Eisenhardt, K. M. (1995). Product development: past research, present findings, and future directions. Academy of Management Review, 20(2), 343–378.
3. Chen HH, Kang YK, Xing X, Lee AHI, Tong Y (2008). Developing new products with knowledge management methods and process development management in a network. Comp. Ind. 59: 242–253.
4. Cooper, R.G., (1999). From experience: the invisible success factors in product innovation. Journal of Product Innovation and Management 16(2), 115–133.
5. Cooper, R. G., S. J. Edgett, et al. (2004). "Benchmarking best NPD practices-III." Research-Technology Management 47(6): 43-55.
6. Cooper, R.G., Kleinschmidt, E.J., 1995. Benchmarking the firm’s critical success factors in new project development. Journal of Product Innovation Management 12(5), 374–391.
7. Cooper, R. G., & Kleinschmidt, E. J. (1987). New products: what separates winners from losers? Journal of Product Innovation Management, 4, 169–184.
8. Davila, T., 2000. An empirical study on the drivers of management control systems’ design in new product development. Accounting, Organizations and Society 25, 383–409.
9. De Toni, A. and G. Nassimbeni (2003). "Small and medium district enterprises and the new product development challenge." International Journal of Operations & Production Management 23((6)): 678-697.
10. Drucker, P.F., 1999. Management Challenges for the 21st Century. Harper Business, New York.
11. Eliashberg, J., Lilien, G. L., & Rao, V. R. (1997). Minimizing technological oversights: a marketing research perspective. In R. Garud, P. R. Nayyar, & Z. B. Shapira (Eds.), Technological innovation: Oversights and foresights (pp. 214–230). USA: Cambridge University Press.
12. Ernst Holger. Success factors of new product development: a review of empirical literature. International Journal of Management Reviews 2002; 4(1): 1-40.
13. Gupta, A.K. and Wilemon, D.L. (1990), “Accelerating the development of technologybased new products”,California Management Review, Vol. 10.
14. Hamel, G., Prahalad, C.K., 1994. Competing for the Future. Harvard Business School Press, Boston, MA.
15. Hanna, V. and K. Walsh (2002). "Small firm networks: a successful approach to innovation?" R&D Management 32(3): 201-207.
16. Haque, B., Pawar, K.S., Barson, R.J., 2000. Analysing organisational issues in concurrent new product development. International Journal of Production Economics 67 (2), 169–182.
17. Haverila (2012) Product–firm compatibility in new product development in technology companies Journal of High Technology Management Research 23 130–141.
18. Johansen K (2005). Collaborative Product Introduction within Extended Enterprises. PhD, Linköpings Universitet.
19. Jones, T., 1997. New Product Development: An Introduction to a Multifunctional Process. Butterworth, Heinemann, Oxford.
20. Krishnan, V., Ulrich, K.T., 2001. Product development decisions: A review of the literature. Management Science 47 (1), 1–21.
21. Lam PK, Chin KS, Yang JB, Liang W (2007). Self-assessment of conflict management in client-supplier collaborative new product development. Ind. Manage. Data Syst. 107**:** 688 - 714.
22. Lester, D.H., (1998). Critical success factors for new product development. Research Technology Management 41(1), 36–43.
23. Loch C, Kavadias S (2008). Handbook of New Product Development Management, Butterworth-Heinemann is an imprint of Elsevier.
24. Lynn, G.S., Abel, K.D., Valentine, W.S., Wright, R.C., (1999). Key factors in increasing speed to market and improving new product success rates. Industrial Marketing Management 28, 320–329.
25. Maffin, D., Braiden, P., 2001. Manufacturing and supplier roles in product development. International Journal of Production Economics 69, 205–213.
26. McQuater, R.E., Peters, A.J., Dale, B.G., Spring, M., Rogerson, J.H., Rooney, E.M., 1998. The management and organizational context of new product development: Diagnosis and self-assessment. International Journal of Production Economics 55, 121–131.
27. Moriarty, R. and T. Kosnik (1989), “High Tech Marketing: Concept, Continuity and Change”, Sloan Management Review, 30 (Summer), 7-17.
28. Poolton, J., Barclay, I., (1998). New product development from past research to future application. Industrial Marketing Management 27, 197.
29. Pullen, A., P. de Weerd-Nederhof, et al. (2008). Configurations of external SME characteristics to explain differences in innovation performance.
30. Sharma, B.N .,(2006) ., “Determinants of New Consumer Product Success or Failure in Nepal”, The Journal of Nepalese Business Studies .,Vol. III No. 1.
31. Suh, N. P. (1990). The principles of design. New York: Oxford University Press.
32. Sun and Wing, (2005.( Critical success factors for new product development in the Hong Kong toy industry, Technovation, 25 pp 293–303.
33. Urban, G.L., Hauser, J.R., 1993. Design and Marketing of New Product, 2nd Edition. Prentice-Hall Inc., Englewood Cliffs, NJ.
34. Urban, G. L., & Hauser, J. R. (1993). Design and marketing of new products. Prentice-Hall.

10/22/2013