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An Assessment of Innovative New Product Development in Indian Manufacturing Industries

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A B S T R A C T

New products are major sources of competitive advantage and success for a manufacturing enterprise. However, not all new product development (NPD) initiatives result in a successful product and are therefore a major cause of wasted resources. Furthermore, NPD processes are becoming increasingly complex and risky due to today's globalized market and customers' desire for technologically advanced products. While there has been a significant interest in academia about NPD risks, the existing literature is spread across multiple outlets, making it difficult for any practitioner or researcher to synthesize the cur- rent work. This article aims to minimize that gap by providing a comprehensive overview of current research activities in the field of risk management in NPD process in one place. The research design is based on mapping and classification of the existing body of knowledge into the domains of NPD risk analysis and management. The article analyses the contemporary NPD risk analysis methods on three fronts: risk identification, risk assessment, and risk mitigation. Based on the review, the article then identifies and discusses several key areas for future research significant to engineering management practices. Finally, an integrated framework is presented to provide a holistic approach toward risk management in the NPD process, followed by the practical implications for engineering managers and practitioners.

Keywords: New Product Development, Risk Management, Literature Review, Integrated Framework,

1. Introduction

The new product development (NPD) process involves a "sequence of steps and activities which an enterprise employs to conceive, design, and commercialize a pro-duct". The purpose of NPD is defined as the "transformation of a market opportunity and a set of assumptions about product technology into a product available for sale". The NPD process is acknowledged by both academia and industrial practitioners as one of the most critical areas of a firm's competence as new products play a pivotal role in success of any business organization. Rapidly growing technological advancements and rising consumer expectations are demanding for new and improved consumer products, making NPD the nexus of competition. In today's globalized and highly competitive market, firms that can develop new and exciting products are more likely to succeed than their peers are. This makes NPD activities the most vital process.[1]

Today, the world is moving from an era of separate national economies to a networked global economy. The advent of liberalisation, privatisation and globalisation has brought forth profound economic, social, environmental and technological pressures on organisations. Markets have become more open and competitive and the customers, more demanding. Competition is fierce in all the aspects of business such as technology, cost, product quality and service [2]. The changes in the current business environment are characterised by intense competition on the supply side and heightened volatility in customer requirements on the demand side. These changes have left unmistakable marks on the different facets of manufacturing organisations [3]. Organisations that want to survive in today's highly competitive business environment must address the need for high quality, lower costs and more effective and swifter Research and Development (R&D) [4]. These formidable changes have forced organisations around the world to adopt innovative and state-of-the-art strategies to suitably address the all-important issues of organisational growth and excellence. Thus, organisations are left with no choice but to upgrade their existing systems, products and technologies for survival [5].

2. Need for technology upgrades

In this modern age, technology is the most important resource of any nation. It is the main driver of a nation's economic development. Fierce competition is forcing organisations across the globe to realise that their survival is not feasible in the absence of R&D and innovation practices [6]. It is high time that the industries wake up and gear up for R&D initiatives to develop cutting-edge technologies for sustained competitive advantage in the global marketplace. Technology upgrades have become mandatory for economic development, industrial growth, an enhanced corporate image, more flexible responses and the strategic self-reliance of an enterprise [7]. For technology upgrades, there are two options:

3. Components of technology development programmes

To assess the status of the indigenous TD initiatives of manufacturing organisations, the following broad areas or key elements have to be investigated. A brief overview of the various components of Technology Development Initiative Programmes (TD Programmes) is discussed.[8]

3.1`Manpower competence

Competent manpower is an important element of the TD initiatives of a firm. Innovative organisations have a significant approach towards manpower development in order to achieve long-term organisational gains. The lack of proper capital and human resources are the major impediments to a manufacturing enterprise's efforts in new industrial TD and such firms have to increasingly rely on external knowledge sources to build up technological competence. Organisations must explicitly strive towards the attraction, development and retention of creative talent. Many innovation champions must be identified, recruited, developed, trained, encouraged and acknowledged throughout the organisation. Innovative companies believe that the bottom line difference between success and failure is finding, developing and nurturing the right people. People should be creative in their thinking process and willing to work tenaciously to attain their goals. Organisations should focus on employing people with broader interests, who are eager to learn and prepared to take some risks. Successful organisations manage their human resources well. Their strategies include effective manpower planning, realistic performance plans, development-oriented performance appraisals, effective learning systems, performance guidance and other mechanisms such as mentoring.[9] Such organisations have the adequate strength of a multi skilled workforce. Strategies range from the identification of areas of skills in which shortfalls either occur or can occur and the efforts made to generate those skills. Highly innovative organisations create and maintain a learning environment by keeping the knowledge and skills of employees up to date. Studies evaluating creative training find that trained subjects perform better than untrained subjects at using instructions to defer judgement and there is a moderate to large effect on creativity. In-house reward systems to motivate employees to achieve the goals of innovation, productivity and profitability are widely used by corporations. Personnel should be rewarded for risk taking, generating new product ideas, experimenting and developing new products. If creative behaviour is rewarded, it becomes the general, dominant way of behaving with employees. The problem is that many organisations hope that personnel will think more creatively and take risks, but they are rewarded only for well-proven, trusted methods and fault-free work. Innovative organisations rely heavily on personalised intrinsic rewards, whereas less innovative organisations tend to place an almost exclusive emphasis on extrinsic awards.[10]

3.2 Technology infrastructure

The absence of adequate infrastructure services is one of the main problems that hinder efforts to develop technology. Developing an adequate financial programme which supports training and educational activities for innovation and building physical infrastructure for enhancing organisational capabilities are the key success factors for highly innovative companies. Advanced equipment and resources are the most important factors to support public and private projects regarding R&D, innovation and technology modernisation.[11] An organisational structure should be such that there are adequate funds, materials, production facilities and information support systems to sustain innovation. For better technological advances, new infrastructures, mainly telecommunications, modern production systems, the latest software for modelling and analysis and new strategic thinking practices, are needed for a hypercompetitive environment. Higher R&D spending heightens the level of research activity within a firm and builds specialised scientific and technical expertise as a result. The tangible outcome of this is the ability to develop several significant product technologies. Manufacturing organisations in developed countries spend 2.5%–18% of their annual turnover on technology development on average. Management must clearly earmark funds for R&D activities aimed at innovations for new product and process developments. Resources are important not only for functional support, but also because having an adequate level of resources for the task/project influences workers' perception that the project is valuable and worthy of organisational support.[12]

3.3 Government support

The scientific and technological development in developing countries depend upon the assistance of several government spheres, particularly from the federal one, to formulate policies and generate financial support mechanisms. Governments can support the small-scale industrial sector by funding R&D projects, establishing effective reward schemes and providing laboratories for R&D work. It can support programmes to build infrastructure as well as incentives (such as tax incentives) and special start-up programmes to develop the private sector. An increase in technological innovation demands that governments should enhance spending on R&D. Governments can play an important role in enabling industry to be creative through the correction of market failures, providing support where the benefits of creativity and design are wider than those for the firm itself or where there are gaps in the efficient supply of finance by the market. The government policies in most countries assist organisations to innovate through funding assistance, consultancy and other policies. The new roles of governments could lie in supporting learning, innovation and building competitiveness. Governments can act as a facilitator of technical change and leveraging, working in collaboration with other stakeholders rather than dictating policies from above.[13]

4. Need for indigenous technology development in India

The industrial scenario in India has undergone a sea change consequent to the globalisation and liberalisation of the economy that began in the country in the early 1990s. After liberalisation was initiated, leading international players targeted India as a key investment opportunity in all areas. Fierce competition has come in both from local and global markets. This competition is marked by rapid technological developments and unprecedented

obsolescence rates. Today, the biggest challenge before the Indian industry is to generate the knowledge base for producing technologies and core competencies to remain competitive globally. This requires extensive R&D efforts for indigenous TD. In the pre-liberalised Indian economy, organisations had not bothered to invest in R&D. Even after opening up the economy, they relied heavily on the external acquisition of technology. The overdependence of firms on external technology acquisition can render their available technologies and skills obsolete, inefficient and outdated. Organisations must move away from their complacent TD initiatives and start managing innovation in R&D activities to develop cutting-edge technologies and products. In the last decade, leading Indian manufacturing entrepreneurs have taken proactive steps to imbibe TD initiatives in organisations to realise enhanced manufacturing performance. The Indian industry is faced with the challenge of adopting technological innovations through in-house R&D as a strategy to stay competitive. In the present context, the R&D function must be regarded as an equal partner in the organisation, that has a huge potential to enhance the competitive advantage of the organisation. The manufacturing organisations in the country have been forced to look out for proactive strategic TD initiatives in the recent past for harnessing their manufacturing competencies to meet the global competition.

5. Evaluation of technology development initiatives in the Indian manufacturing industry

The present study depicts the results of a detailed survey related to the TD practices adopted in the Indian manufacturing industry. The objective of the survey is to evaluate the status of prevailing technology innovation-related capabilities of the Indian manufacturing sector and ascertain the exploits of the manufacturing entrepreneurs across the northern region of this country with various TD practices. The analysis of the survey has been carried out from the following viewpoints: status of the industry with regard to the existence of facilities and programmes for TD through indigenous research, the effectiveness and extent of deployment of various components of TD Programmes and the overall standing of industries in different TD components leading to classification into various categories.

Conclusion

Today, the biggest challenge for the Indian industry is to generate the knowledge base for producing technologies and core competencies to remain competitive globally. The Indian industry is faced with the task of adopting technological innovations through in-house R&D as a strategy to meet stern competition. In this context, the R&D function must be regarded as an equal partner in the organisation that has a huge potential to enhance the competitive advantage of the organisation. The manufacturing organisations have been forced to look out for proactive strategic technology development initiatives to harness their manufacturing competencies. The present research reveals that the small-scale manufacturing sector in the country lacks in several issues associated with the basic components required for any TD Programme and the R&D function has not received much attention in the past. Traditionally, Indian manufacturing organisations have suffered from inherent deficiencies, having often been plagued with teething problems, and have struggled to realise the same level of benefits as that reaped by developed countries. Moreover, it has been observed that the R&D function has been viewed as a means for fire fighting of production problems and the actual implications of manpower competence inadequacies, the lack of technology infrastructure and other inefficiencies have still not been extensively explored to realise business objectives. However, a few organisations have taken proactive initiatives to improve the R&D function's effectiveness for realising enhanced manufacturing system performance. It can be concluded that Indian entrepreneurs must continue to make sincere efforts in their ventures to realise improved competitiveness through technology innovation initiatives.

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