

Chapter 44

Technology Project Portfolio Selection in Industry 4.0

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ABSTRACT

Industry 4.0 transformation is creating changing dynamics in business and becoming a highly important concept that requires the support of top management for projects and investment. As a result of transformation processes, Industry 4.0 develops more productive and continuous systems, and companies have been searching for the right adaptation of this transformation. In order to succeed in this Industry 4.0 transition, decision-making regarding the selection of profitable technology projects is a key point for companies. The proposed model incorporates two important goals: profit maximization by selecting technology projects and the development of simulation-based optimization with a three-step stage-gate model for technology project portfolio management under conditions such as resources, costs, and the probabilities of completion of stages and success. The stage-gate system contributes to the model development through the various steps from idea to launch and helps manage the Industry 4.0 transition process to improve effectiveness and efficiency.

INTRODUCTION

Many leading firms have installed Project Portfolio Management (PPM) processes to increase their strength against the competitors in the markets. Nowadays, PPM is becoming indispensable for achieving success and prosperity and even for corporate survival. Too many projects and teams fail to differentiate between products and are unable to succeed in innovation.

Poor organizational design, lack of leadership, poor quality of execution, and unreliable technical and financial data are possible reasons for failed projects. Companies can disappear if they do not place importance on innovative activities such as keeping their project portfolios current and competitive. In

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order to overcome this fierce battle, companies are learning PPM processes (Cooper and Edgett 2001). Industry 4.0 transformation requires strategic planning, which includes high capital investment, training of personnel, and changes in the environment and culture.

To integrate Industry 4.0, technology projects are developed that will result in increased efficiencies. The main results of transformation are integration of the whole chain, where humans, machines, and resources can communicate directly with each other and products are smart and know how they will be manufactured. To achieve these increased efficiencies, technology projects should be taken into account whereas transformation processes in Industry 4.0 have uncertainties and limited resources. Effective management of the portfolio of technology projects in the transition to Industry 4.0 can be a main initiative for a company's future achievement (Isikli, Yanik, Cevikcan and Ustundag, 2018).

To begin with, the definition of "portfolio management" is expressed as a dynamic decision process for constantly updating and revising a list of active technology development projects.

The four aims of portfolio management are (Pinto, 2016; De Reyck, Grushka-Cockayne, Lockett, Calderini, Moura, and Slope., 2005; Kaiser, El Arbi, and Ahlemann, 2015):

- To increase the value of the portfolio as far as possible
- To seek the right priorities and balance among the projects
- To ensure that the new product portfolio is aligned with the company strategy
- To keep the total number of projects small depending on limitations on available resources

PPM is an important concept which includes assessing, selecting, organizing, and allocating resources for the process of evaluating, selecting, prioritizing, and allocating resources to product development projects (Cooper, Edgett and Kleinschmidt, 2001). Moreover, PPM considers objectives which maximize the total benefit by considering scarce resources.

The decision process addresses uncertain and changing information, dynamic opportunities, and various strategic objectives and considerations. There are many reasons why PPM is vital for successful Industry 4.0 transition: to make strategic choices about the business strategy and the types of products, markets, and technologies; to allocate resources such as scarce and vital R&D, engineering, marketing, and operations; and to balance resources; for example, errors such as trying to do many projects with limited resources may lead to longer cycle times, poor quality of execution, and underperformance of new products.

Technology PPM aims to maximize the economical aspect of the new technology investments within the framework of Industry 4.0 while considering uncertainties, risk factors, and limited resources (Isikli et al., 2018). The development of a technology project concerns how we distribute our resources. In today's Industry 4.0 era, it is very important to determine the priorities among various projects and to guide the resources into selected projects.

To select and design the best business process, it is very important to anticipate the future of the industry in terms of new product development. In addition, one of the most important ways to implement the strategy of the business unit is to develop technology projects in the Industry 4.0 era in accordance with the company's PPM strategy within the framework of Industry 4.0. If the resources of the company are spent on the wrong projects, insufficient resources will remain for more resource-deserving projects. All of these decisions are crucial for implementing an effective technology project portfolio selection. For this reason, this study deals with how the business should invest its technology project resources

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