Chapter 38
Feasibility Analysis of Industry 4.0 Projects and an Application in Automotive Maintenance Systems

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ABSTRACT

In this chapter, general feasibility analysis steps are redefined for the Industry 4.0 projects. In addition to the traditional feasibility analysis steps, for Industry 4.0 projects, scenario analysis and decision trees are implemented to feasibility analysis that enables us to identify the outcomes of several scenarios for the risky parameters. At the end of the chapter, proposed feasibility analysis procedure is applied to an Industry 4.0 project. Utilization of internet of the things on an automotive maintenance service system is selected as the case study. In this project, the proposed system for the automotive maintenance service sector is a web-based application, which warns driver and maintenance service provider at the same time before the failure happens and by this way enables drivers to have the maintenance before the failure occurs. The versions of the proposed system are analyzed, and the best version is selected at the end of the analysis.

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INTRODUCTION

The last version of industrial revolutions, Industry 4.0 is a concept, which was introduced at Hannover Exhibition in Germany. In general, this version which can be defined as the automated version of the third industrial revolution, covers the innovation of new generation robots in manufacturing by understanding the systems in production with artificial intelligence and learning algorithms creating a global communication network and using the obtained data as information with concepts such as big data.

Industry 4.0 brings solutions to companies especially in the field of competition with differentiation strategy. Consumers expect new technological developments as soon as possible with lower cost. The finished products can be produced much faster with flexible production systems and can be penetrated to market in the same way. Thus, the Industry 4.0 meets customers' expectations. Therefore, Industry 4.0 projects have become more popular for the companies to survive in competitive environments.

Most of the Industry 4.0 projects require sizeable initial investment amounts due to the need of advanced technologies. The pioneer of the Industry 4.0 concept the German government has invested € 200 million in the first stage for the project, which includes indigenizing innovations such as reducing carbon emissions, building eco-friendly and smart cities, using alternative fuels, switching to smart networks. This amount is only a starting value for the production and use of new technologies.

The developments that will be used more frequently with Industry 4.0 or will be first appeared can be count as cyber physical systems, horizontal and vertical integration, internet of things, machine learning, big data and data analytics, cloud computing, virtual reality, 3D printers and cyber security.

The implementation of these new technologies needs huge investment budgets, which makes feasibility analysis of an Industry 4.0 project very crucial for the managers to gather the best and worst scenarios of the investment decisions.

The main objective of the feasibility analysis is determining the viability of the project in the planning phase of project management. Feasibility analysis of Industry 4.0 projects become different due to the lack of information about the undeveloped technologies and their unpredictable success levels. Therefore, in the planning phase of project management, different scenarios should be analyzed and feasibility analysis outcomes should have different back up plans in case of unsuccessful technologies.

Mostly companies, which need an improvement on their systems by application of Industry 4.0 tools, has different alternative Industry 4.0 projects that utilize different tools and have different outcomes. To analyze an improvement on the system, all possible versions of Industry 4.0 projects should be analyzed at once to find out the best project. Decision trees are useful when different scenarios are examined. Therefore, to find out the best investment project feasibility analysis and decision trees are used together in this chapter.

The purpose of this chapter is to propose a framework for the feasibility analysis of Industry 4.0 projects, which utilizes scenario analysis for the determination of best Industry 4.0 tools and decision trees to handle risks on the assumptions of the parameters of investment projects.

The chapter organized as follows: At first general background and information on traditional feasibility analysis, decision trees and capital budgeting techniques are given. Then a framework for feasibility analysis of Industry 4.0 investments is proposed and explained in detail. At the end, the chapter concludes with an application of the proposed method on an investment project in automotive maintenances sector.