

Selecting the Most Desirable IT Portfolio Under Various Risk Tolerance Levels

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ABSTRACT

To better assist decision-makers (e.g., enterprise executives) in selecting the most desirable IT portfolio, this study proposes a new IT Portfolio Efficient Frontier model that incorporates the decision-maker's risk tolerance levels. The proposed model, built on portfolio optimization along with experimental design and simulation data, considers three IT portfolio scenarios: even distribution-based IT portfolios, uneven distribution-based IT portfolios, and dominant IT portfolios. Our findings show that the IT portfolio efficient frontiers derived from both an even distribution-based IT portfolio and an uneven distribution-based IT portfolio have a relatively positive relationship between IT portfolio risk and return. Our findings also indicate that if IT investments are part of a dominant IT portfolio, an inflection point of the IT portfolio efficient frontier appears under the decision-maker's medium risk tolerance level, and the most desirable IT portfolio is generated when a decision maker's risk tolerance level is medium or higher.

KEYWORDS

Efficient Frontier, Enterprise Executives, IT Portfolio Management, Risk Tolerance Levels

INTRODUCTION

In 2018, global information technology (IT) spending grew by 6.2% to \$3.7 trillion US dollars according to the latest forecast by the research firm Gartner, Inc. (2018 <https://www.gartner.com/newsroom/id/3871063>). Chan et al. (1997) found that the "fit" between information systems (IS) and business objectives is significantly associated with the performance of a firm. In fact, evidence increasingly shows that investment in IT can produce value at a variety of organizational levels. At the firm level, research has demonstrated that IT investment translates into profitability (e.g., Mithas et al., 2012). Meanwhile, a number of IS researchers have drawn attention to the concept of IT Portfolio Management (ITPM), a system for managing the total IT-related investments within an enterprise (Weill and Vitale, 2002), and ITPM is expected to improve the performance of IT investment (Jeffery and Leliveld, 2004). With regard to a firm's IT resources, IT portfolios can be thought of as a bridge that connects projects to the firm as a whole. The concept of ITPM is similar to the concept

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of financial portfolio management, but a significant difference is that IT investments are not liquid, as are stocks and bonds in the financial market. As a result, IT investments may need to incorporate both financial and nonfinancial methods for evaluation (Betz, 2007).

IT-driven business activities are enabled by IT investment projects; however, there is very limited research on IT (project) portfolio selection issues in the ITPM domain. Hence, the motivation of this research is to propose a new decision-making model to assist enterprise executives in selecting the most desirable IT portfolio when dealing with IT investments under various risk tolerance levels. Our study follows the argument of Aral and Weill (2007) that a firm should determine its IT investment allocation based on its strategic priorities. In line with Bhatt and Grover (2005), and Kohli and Grover (2008), making appropriate strategic IT investment choices is a critical capability for maximizing firm performance in the long run. On the other hand, Dewan et al. (2007) indicate that IT investments are much riskier than non-IT capital investments, as measured by their relative contributions to the overall riskiness of the firm. For these reasons, this study addresses the following research question: “How can a firm select the most desirable IT portfolio to improve the efficiency of IT resource allocation under different risk tolerance levels?”

The proposed new methodology, including the IT Portfolio Efficient Frontier model, is composed of concepts from Data Envelopment Analysis (DEA) and the Modern Portfolio Theory (MPT), as well as a risk assessment component, to articulate the risk tolerance levels of decision makers. Specifically, the proposed model, built on portfolio optimization along with experimental design and simulation data, will be able to consider three IT portfolio scenarios: (1) even distribution-based IT portfolios, (2) uneven distribution-based IT portfolios, and (3) dominant IT portfolios. Even distribution-based IT portfolios would include a low level of variance in the size and scope of the individual IT investment projects while uneven distribution-based IT portfolios would involve a high level of variance. Dominant IT portfolios would include a very large (dominant) IT investment project along with a number of smaller projects.

The study contributes to our understanding of ITPM research and practice. The proposed methodology, including the IT Portfolio Efficient Frontier model, can be considered to be a new approach in the ITPM literature, and practitioners may leverage the proposed new model to boost the performance of IT portfolios based on various risk tolerance levels of decision-makers (e.g., senior executives) when making IT investment decisions. The remaining sections are organized as follows. The next section reviews the related theoretical studies and this is followed by a description of the proposed IT Portfolio Efficient Frontier model. Use of the proposed model is then illustrated with a hypothetical example and computational analysis. The paper concludes by presenting the main findings and identifying directions for future work on this research topic.

THEORETICAL BACKGROUND

Ensuring projects are aligned with strategy to achieve portfolio balance is regarded as the foundation of project portfolio management (Clegg et al., 2018). Further, the Modern Portfolio Theory (MPT) refers to the principles underlying the analysis and evaluation of rational portfolio choices based on trade-offs between risk and return when considering investment decisions (Markowitz, 1959). In line with the portfolio theory, the portfolio choice that involves greater return and less risk is considered to be superior (e.g., more efficient) than the portfolio choices that involve less return and greater risk. Compared to conventional financial investments such as stocks and bonds, IT investments are considered non-liquid investments and IT portfolio management is the application of systematic management to large classes of items managed by enterprise IT groups (Bentley and Davis, 2009). To better cope with the relationship between risk and return while making decisions about IT portfolio selections, this study aims to develop a risk assessment method to evaluate IT investment risk based on established theory that is incorporated into the proposed IT Portfolio Efficient Frontier model.

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