Thoughts of Using Economic Decision-Making to Systems Engineering and Systems Thinking
An Exploratory Study

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ABSTRACT
System engineering is an art that tries to capture the requirements that are imposed by stakeholders. Economic decision-making is an essential tool for systems engineers to accomplish that goal. However, a decision as a whole in systems engineering can be summed up in the following three element process: utility analysis by 17 evaluation criteria, human behavioral analysis by 6 evaluation criteria, the calculation of Net Present Value, IRR, and other economic decision-making indicators. The author will further discuss the NPV and IRR methods to discover some hidden pitfalls. Also, this article will discuss some newer methods/techniques that avoid these pitfalls in economic decision-making by accounting for the risk associated with these methodologies.

KEYWORDS
AHP, Economic Decision-Making, IRR, MCDM, NPV, Project Management, ROI, Systems Engineering, Systems Thinking

INTRODUCTION
Background to the Topic
Economic decision-making is essential when trying to get the biggest bang for your buck. This process is done to maximize your benefits and, at the same time, minimize your costs. There are three elements to consider when using decision-making in systems engineering & systems thinking: utility analysis (Essig et al., 2015); human behavior analysis (Samson, 2014); and Economic Analysis (Essig et al., 2015).

In most cases, researchers have not fully realized system engineering, as it remains misinterpreted and not clearly defined. As a result, the components of SE are examined for research on the best aspects to be applied to project management. System engineering is known for aiding in the completion of projects, as it has many techniques and tools (Essig et al., 2015). Also, some hierarchies are comprised of smaller systems to be applied to large projects, such as engineering. SE features many skills and tools that focus on the general notions (functions, requirements, etc.), which are believed to enforce project management techniques, as well as conventional engineering settings (Samson, 2014). The theoretical aspect still features problems, as critics say that the analysis is not in-depth enough to see project progress (Samson, 2014).

Applying SE into economic decision-making should be valued for its ability to improve project efficiency by integrating the two domains. Before addressing the problem of combining the two

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fields, we study their differences. Since the program depends on the customer, the product should have a market, control requirement, or business that will put the right metrics in place. Customer requirements should be a priority during the development of general project requirements. Thus, an engineer in SE makes sure to identify the product requirement is not only verified but is also validated (Samson, 2014).

In SE, to verify a product requirement is to accomplish as enlisted, but validation entails customer satisfaction. A project manager aims to fulfill what is required for the product and project while considering resources, cost, and time. The International Council on Systems Engineering claims that project management shares the same objective with system engineering, so project management gives the definition and SE delivers.

Multiple organizations have taken on system engineering to help with completing difficult projects, such as telecoms industries, defense, and transportations. Implementing system engineering into project management eases the transition of tasks for those involved, which reduces anxiety and increases quality (Essig et al., 2015).

Primarily, this study aims to use guides, preceding research, and other studies to demonstrate how system engineering relates to economic decision-making. This study considers preliminary stages of engineering environment, techniques in commercial research and development, and the measures on SE activities in decision-making performance. This is done to demonstrate how systems engineering affects development efforts while focusing on particular areas like SE Tools.

Research Gap
Even though there is a research gap in the pre-existing literature, it is exemplified how these variables, concepts, and models are vital facets of operations and project management. This research gap lies within the limited literature addressing the way in which these variables, theories, and models help operations in project management to progress at a steady pace. However, these knowledge gaps are at the root of this study, as it will address how these variables, concepts, and models operate in operations and project management. Also, this study will focus on the elements and applications within them. Knowing how these variables, concepts, and models are both alike and different will help researchers to comprehend better how they all relate.

Problem Statement
Systems engineering is a wholesome approach that develops and builds complex machines and processes. The primary purpose of systems engineering is to deliver a product that meets stakeholder specification. Some of the traditional economic tools that systems engineers use to evaluate different alternatives for feasibility are net present value (NPV), internal rate of return (IRR), return on investment (ROI), benefit cost ratio (B/C), and breakeven point analysis.

However, there is a debate in the academic circles about a reinvestment rate assumption between the net present value and internal rate of return, which is discussed by Illes (2016). The confusion arises from the treatment of orthodox cash flow patterns with different cash flow patterns that are expecting the same NPV and IRR (Margulis & Galli, 2017; Illes, 2016; Bajracharya, 2014).

With the advancement of technology, there are better tools available in the market, such as real options analysis (ROA) and equity breakeven point analysis (EBPA). These tools can better account for risk and provide a better assessment for managers when engaging in economic decision-making. Upon doing research, it was noted that there is a lack of literature for these new tools and their implementation in the systems engineering field, as well as in project management.

Research Objective
Current literature does not focus on how these variables, their concepts, and models cause a smooth progression in project management, as there is only literature illustrate how important they are. Thus, this has developed a research gap that is the inspiration behind this study. With this research, we
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