Chapter 2
Using Systems Engineering for the Development of Decision Making Support Systems (DMSS):
An Analysis of System Development Methodologies (SDM)

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ABSTRACT

Decision Making Support Systems (DMSS) can mitigate the risks involved in highly uncertain processes where novelty is high, such as NPD resource management. However such systems manipulate complex organisational information and require embedding within the business it operates within. There is a risk of poor acceptance in the business if the DMSS does not take into account a number of business related considerations. Utilising a systems approach literature was analysed, from which a set of considerations pertinent to the development of DMSS was elicited. Through the assessment of a number of System Development Methodologies (SDM), it was found that no one System Development Methodology (SDM) took into account all considerations identified. There is therefore a clear gap in current research and a real need for such a methodology which addresses the considerations identified.

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INTRODUCTION

Browning et al. (2006) described the product development process as "a kind of complex system, arguably even more complex than the system it produces" (Browning, Fricke, & Negele, 2006). This complexity exists due to the array of technical issues that present themselves, as well as the variety of people and organisational structures employed (Smith & Morrow, 1999). Due to the innovative nature of NPD projects, uncertainty and complexity are often inherent parts of development projects. This complexity was identified by Lebcir (2002), who stated: "NPD projects are inherently complex because they involve development of products which carry some degree of novelty" (Lebcir, 2002). Lebcir (2002) added that this inherent uncertainty and complexity often made it difficult for managers to plan how a project should be undertaken due to issues such as task variations, task duration changes, and changes in the resources required. The variations experienced in a project are a result of continual evolution and development of the NPD process, resulting in varying complexity and scope i.e., size of both the products produced and the processes utilised.

One area within NPD where uncertainty and complexity have a significant impact is in resource management; due to the fact that the resource management process has to respond to the NPD process as it evolves and develops. Joglekar and Ford (2005) stated that efficient and effective resource management of NPD projects is extremely important to the timely completion of projects (Joglekar & Ford, 2005). When the resourcing decisions of NPD projects are inaccurate due to complexity and uncertainty; project lead times, quality of output, and resource availability for other projects can be adversely affected (Cooper & Edgett, 2003). This can result in a reactive rather than proactive approach to resource-based decision making, solving resource issues as they arise, which is stressful for managers making time critical resourcing decisions. In order to alleviate these shortcomings there is a need within NPD for more proactive approaches for considering resourcing scenarios and dynamically planning and resolving resourcing issues before they occur.

A number of tools and techniques are commonly adopted by resource managers to facilitate the planning and direction of NPD resource management in a proactive manner (Cooper & Edgett, 2003; Yahaya & Abu-Bakar, 2007). Managers often use spreadsheets to review current resourcing levels; also algorithms can be utilised to predict resource requirements for projects. One tool that is frequently used is DMSS which responds to a need for a means to enable the better documentation, communication, understanding and especially learning (Negele, Fricke, Schrepfer, & Härtlein, 1999; Zayed & Halpin, 2000).

Biazzo stated: "it has been widely recognised that models can offer useful, and relatively inexpensive, descriptions which can help towards improving business processes" (Biazzo, 2002). DMSS provides an opportunity for the testing of scenarios and the subsequent improvement of management processes without the need for actual implementation. The benefit of this is that there is no need to disrupt a management environment in order to test proposals. Scenarios can therefore be tested extensively and improved on before implementation, so as hindrances that could negatively impact productivity can be worked upon.

An important consideration for the success of a DMSS project is the approach which is taken towards its development. This requires an understanding of the steps which have to be carried out through the course of the development project. Without this understanding and an associated systematic method for the development of the solution the developed DMSS can become missdirected and provide ill-defined and inappropriate solutions (Nordgren, 1995; Royce, 1970; Ülgen, 1991).

The efficient and effective deployment of a DMSS within a business context is dependent on a number of factors, such as the uncertainty and