Effective IT planning remains a key issue for managers who seek to maximize the return on their investments in information systems. Managing the risks associated with investments in IT represents an important, but understudied, aspect of the IT planning process. Recognizing that individual projects carry different levels of risk, it has been suggested that managers adopt a portfolio approach toward investments in IT. Under such an approach, individual projects would be evaluated not just on their own merits but on the basis of their contribution to the overall risk of an organization’s IT project portfolio. While the portfolio approach has intuitive appeal, it has been criticized for failing to provide a more direct linkage between the concepts of risk and return. In this paper, we draw upon financial portfolio theory to extend and explore the concept of a portfolio approach to managing IT project risk. In particular, we present a model that assesses an individual project in terms of its contribution to the overall risk of the IT project portfolio. The properties of the model are then examined using a simple two-project portfolio. A simulation using the model illustrates how an IT manager can take maximal advantage of the effect of diversification by selecting projects that are negatively correlated. In short, the paper demonstrates how to manage the risk/return tradeoff through careful selection of IT projects and appropriate allocation of resources among these projects.

Information technology (IT) has become critical to the survival of most firms. While the strategic benefits of IT investments can be significant (Clemens, 1991; McFarlan, 1991), the risks associated with IT failure have never been greater. Given that IT organizations must function within an environment of limited resources, effective IT planning remains a key issue for managers who seek to maximize the return on their investments in information systems (Brancheau & Wetherbe, 1987; Dickson, Leitheiser, Wetherbe, & Nechis, 1984; Hartog & Herbert, 1986; Raghunathan & Raghunathan, 1989).

The importance of IT planning has been recognized since the late 1970s (King, 1978). Conceptually, IT planning operates on multiple levels. At the highest level, IT planning provides a link to the overall business plan by setting priorities and identifying direction for the deployment of IT resources. At a somewhat lower level, these IT plans must be translated into a specific portfolio of software applications to which resources can then be allocated. This multi-level view of IT planning is shown in Figure 1.

Most approaches toward IT planning represent a high level attempt to ensure that the overall IT strategy is consistent with the firm’s corporate strategy and the competitive environment in which it operates. While this is undeniably an important aspect of the IT planning process, the IT strategy can only be effective if it is translated into a project portfolio that is both doable and worth doing. This paper focuses on the selection and management of the projects that make up this portfolio. As shown in Figure 1, this translation process is frequently referred to as “project selection” and ultimately requires the allocation of resources among IT projects that make up the applications development portfolio. It is during the process of project selection that managers must decide whether a project offers a reasonable return on investment (i.e.
whether it is worth doing) and whether the project falls within an acceptable level of risk (i.e. whether it is doable). Risk or exposure to risk may be increased or decreased through the allocation of resources among different projects.

Managing the risks involved in selecting and managing a portfolio of IT projects represents an important, but understudied, aspect of the IT planning process. While numerous research articles have appeared on the problem of IT project selection, most have failed to consider explicitly the fundamental tradeoff between risk and return (Buss, 1983; Ginzberg, 1979; Guimaraes & McKeen, 1988; Kira, Kusy, Murray, & Goranson, 1990; Lawrence, Marose, & Lawrence, 1983; Lucas & Moore, 1976; McFarlan, 1981; Melone & Wharton, 1984; Santhanam, Muralidhar, & Schniederjans, 1989). Although risk is often regarded as a factor to be considered in the project selection process, the usual approach is to consider individual project risk rather than overall portfolio risk.

McFarlan (1981), however, has suggested that managers adopt a portfolio approach to the selection of IT projects. His approach is based on the premise that managers who invest in IT and wish to control their exposure to risk should focus on the risk of the entire portfolio of IT projects rather than that of any single project. Thus, McFarlan would argue that IT managers can minimize their exposure to risk in the same way that financial portfolio managers are able to minimize risk by constructing a diversified portfolio of stock holdings.

While the underlying merit of the portfolio approach is not in dispute, McFarlan’s work has been criticized for failing to operationalize a more direct and quantitative linkage between the concepts of risk and return. In this paper, we present a mathematical model for measuring and assessing application development portfolio risk that is analogous to the way in which financial portfolio theory can be applied to evaluate the risk associated with an investment portfolio. The model takes into account the notion that IT projects are interdependent and that the risk associated with a portfolio of IT projects is not simply the sum of the risks associated with individual projects.

The approach presented in this paper provides IT managers with a quantitative tool for balancing IT portfolio risk. The model allows the IT manager to evaluate and select individual projects based on their contribution to the overall risk of the IT portfolio. For IT researchers, the model operationalizes and extends the concept IT portfolio risk providing a foundation for the development of more sophisticated risk metrics.

The remainder of this paper is organized into five sections. First, background literature relevant to IT project selection is reviewed briefly. Next, the model is presented and a simulation demonstrates the use of the model for selecting and managing two hypothetical IT projects. In addition, the implications of using a portfolio theory approach are discussed, and some conclusions and directions for future research are provided in the last two sections.

**Background**

In an environment characterized by increasing user expectations and pressure to accomplish more with fewer resources, IT managers must continually make informed decisions regarding the allocation of scarce resources among new projects and the maintenance or reengineering of existing systems (Konsynski, 1985). The set of IT applications that are planned or currently under development make up the applications development portfolio (Alter, 1992).

Within the IT literature, four basic approaches have been advocated for selecting IT projects: cost/benefit analysis, scoring or ranking models, management science models, and the portfolio management approach (Melone & Wharton, 1984; Santhanam, et al., 1989). While they are not mutually exclusive, each approach represents a different perspective toward the selection problem. Cost/benefit analysis, the traditional approach for selecting projects, is an attempt to quantify the costs and savings (or profit) associated with potential projects. A variety of techniques can be used to perform such an analysis including: return on investment calculations, net present value analysis, and so on. Under most such analyses, the project(s) with the highest return would be selected. Cost/benefit analysis is advantageous because it provides a quantitative measure of the worth of a project in language that managers can readily understand (Melone & Wharton, 1984). The primary problem with such an approach is that it is often difficult to apply standard cost/benefit techniques to IT projects “due to the strategic impact of IS and the large number of intangible benefits arising from IS projects” (Santhanam, et al., 1989). Hence, the use of cost/benefit analysis alone may distort the project selection process by failing to account for important qualitative or subjective factors. Scoring and ranking models represent an attempt to correct this problem (Buss, 1983; Lucas & Moore, 1976).
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