Investment in new technologies is considered by firms as a solution to improve their productivity, product and service quality and their competitive advantages in the global market. Unfortunately, not all technology adoption projects have met their intended objectives. The complexity of technology adoption along with little consideration of the long term cost of the technology, are among the factors that challenge companies while adopting a new technology. Companies often make new technology adoption decision without enough attention to the total cost of the technology over its lifecycle. Sometimes poor decision making while adopting a new technology can result in substantial recurring loss impacts. Therefore, estimating the total cost of the technology is an important step in justifying the technology adoption. Total Ownership Cost (TOC) is a wildly-accepted financial metric which can be applied to study the costs associated with the new technology throughout its lifecycle. TOC helps companies analyze not only the acquisition and procurement cost of the technology, but also other cost components occurring over the technology usage and service stage.

The point is that, technology adoption cost estimation is a complex process involving consideration of various aspects such as the maintenance cost, technology upgrade cost and the cost related to the human-resource. Assessing the association between the technology characteristics (technology upgrades over its life cycle, compatibility with other systems, technology life span, etc) and the TOC encompasses a high degree of complexity. The complexity exists because there are many factors affecting the cost over time. Sometimes decisions made today can have long lasting impact on the system costs and there is a lag between the time the decision is taken and when outcomes occur.

An original contribution of this dissertation is development of a System Dynamics (SD) model to estimate the TOC associated with the new technology adoption. The SD model creates casual linkage and relationships among various aspects of the technology adoption process and allows decision makers to explore the impact of their decisions on the total cost that the technology brings into the company.

The SD model presented in this dissertation composes of seven sub-models including (1) technology implementation efforts, (2) workforce training, (3) technology-related workforce hiring process, (4) preventive and corrective maintenance process, (5) technology upgrade, (6) impact of technology on system performance and (7) total ownership cost sub model.

A case study of Enterprise Resource Planning (ERP) system adoption has been used to show the application of the SD model. The results of the model show that maintenance, upgrade and workforce hiring costs are among the major cost components in the ERP adoption case study presented in Chapter 4.

The simulation SD model developed in this dissertation supports trade-off analysis and provides a tool for technology scenarios evaluation. The SD model presented here can be extended to provide a basis for developing a decision support system for technology evaluation.