Chapter 6
ICT Investments and Management for Organizations

Georgios N. Angelou
University of Macedonia, Greece

Anastasios A. Economides
University of Macedonia, Greece

ABSTRACT
Developing the Information and Communication Technologies (ICT) strategy that supports the overall organization's business strategy is critical for generating business value. Recognizing the inadequacy of traditional quantitative cost-benefits analysis for evaluating and managing ICT investments, researchers suggest multi-criteria analysis, integrating quantitative and qualitative modeling. This chapter introduces the Balance Scorecard (BS) decision analysis framework and combines it with Real Options (ROs) analysis, in a qualitative and quantitative perspective, for modeling the business flexibility as well as for evaluating and controlling the ICT investments strategy. The multi-criteria ROs modeling applies to all perspectives of the BS framework providing a holistic decision-making model for ICT business.

INTRODUCTION
In a competitive business environment, it is necessary for organizations to take advantage of every opportunity to reduce cost, improve quality and provide service. Information and communication technologies (ICT) constitute a strategic asset for organizations. Organizations rely on ICT for both their technology infrastructure and their specific applications to conduct their core business. ICT markets all over the world recently have been, and still are, undergoing drastic changes, fuelled my market reforms and technological progress. Organizations find ICT compelling due to improved customer satisfaction, reduce operations cost, increased organizational productivity, and rapid application development.

The valuation and management of ICT business activities is a challenging task because it is charac-
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Characterized by high-level uncertainty and tangible and intangible effects. Gomez et al. (2010) argued that it is not sufficient to focus on the easily measurable tangible and quantifiable benefits of ICT. They motivated that the intangible benefits of ICT on development such as empowerment, self esteem and social cohesion are more important from a developmental perspective. In addition, Zehir et al. (2010) analyzed the relationship between information technology (IT) investment level, IT usage, IT perception, IT at decision making process, future orientation, technology orientation and firm performance in the comprehensive competitive environment. The findings of their study showed that IT investments are vital component of firm performance and if firms manage IT investments successfully, they will enhance firm performance.

Also, Lin et al. (2007) examined the relationship between the levels of IT maturity and the use of IT investment evaluation and benefits realization methodologies via case studies and survey in the service sector. The findings indicated that IT maturity has a positive impact on the adoption of IT investment evaluation and benefits realization approaches. In risk management perspective, Otim et al. (2012) examined the effect that investments in information technology (IT) have on downside risk profiles of companies that made public announcements of their investments in technology. They found evidence that IT investments and their timing influence organizational downside risk. In addition, transformational and informational IT investments lead to a reduction in downside risk only if they lead to strategic IT investments in the industry.

In overall, although a vast array of methodologies for ICT investments evaluation present in the literature, some argued that a multi-perspective or integrated approach is needed combining specific decision analysis techniques, such as Delphi and Analytic Hierarchy Process (Azadeh et al., 2009; Gunasekaran et al., 2006).

ICT investments should consider operational, management and strategic perspectives. Particular, ICT investments in operational management are related to processes that embody the execution of tasks comprising the activities of an organization’s value chain. Investments in the area of management may include processes and activities related to the administration, allocation and control of resources within the organization. Also, investments in strategic perspective could include processes such as planning, forecasting and strategy implementation.

In parallel, ICT can have four distinct but complimentary effects on business evaluation. It is through the following four effects on business processes that ICT creates value. First, automotive effects refer to the efficiency perspective of value coming from the role of ICT as a capital asset being substituted for labor, deriving productivity improvement, and cost reductions. Second, Information effects are related to ICT capacity of collect, store, process, and disseminate information. Following these effects, business value (i.e. Return On Investment) accrues from improved decision quality, and enhanced organizational effectiveness. Third, transformative effects refer to the value of business process reengineering and redesigned organizational structures. Finally, growth effects are related to organizations core business expansion in other business fields based on existing ICT infrastructure indicating growth business opportunities.

The aforementioned analysis concerns quantitative and qualitative measures and applies to organization’s internal processes, customers, overall economic and growth business perspectives.

The valuation of ICT investments and the management of their implementation and exploitation require multi-attribute analysis adopting multicriteria analysis and combination of quantitative and qualitative measures.

This work discusses all these issues and includes them in a multi-attribute perspective providing a holistic methodology and model for ICT investments managements for business strategy formulation, evaluation and implementation. It