Model-Supported Alignment of IS Architecture

Andreas L. Opdahl
University of Bergen, Norway

INTRODUCTION

An *information system (IS)* is a system that communicates, transforms, and preserves information for human users. An information system comprises one or more software applications and databases, and their relationships to their human users, operators, and maintainers.

A modern enterprise has many information systems that can be related in various ways. For example, information systems can be *related by exchange* because they exchange data through message passing or shared databases, or because they exchange functions through remote procedure calls or Web services. Information systems can also be *related by overlap* because they maintain the same data or provide the same functions. Information systems can be related in many other ways too, either *directly*, such as when one IS controls another, or *indirectly*, for example, because several ISs depend on the same run-time platforms or because they compete for their users' attention or for computer resources. In addition to being related to one another, information systems can be related to the *surrounding organization* in many ways. For example, organization units such as departments, individuals, or roles may be the *owners*, *users*, *operators,* or *maintainers* of ISs; organizational goals and strategies can be *realized by* ISs; organizational processes can be *supported* or *automated by* ISs; and so on.

The *information systems (IS) architecture* of an enterprise comprises its information systems, the relationships between those information systems, and their relationships to the surrounding organization. In addition to single enterprises, *alliances* of enterprises and *parts* of enterprises, such as divisions and departments, can have IS-architectures too. The above definition implies that *every* enterprise has an IS-architecture, even if that architecture is not explicitly talked about, described, or managed: 'IS-architecture' is a way to look at organizations and their information systems.[1]

IS-architecture alignment is the process of selecting an *IS-architecture vision* towards which the architecture should be incrementally but systematically evolved. This article will present a model-supported framework for aligning an IS-architecture with its surrounding organization (Opdahl, 2003a). The framework shows how an enterprise's *current* IS-architecture can be represented in an enterprise model, from which *candidate architecture visions* can then be generated, before one of them is selected as the enterprise's IS-architecture vision.

BACKGROUND

Zachman (1978) defines 'IS-architecture' as "the sum total of all information-related flows, structures, functions, and so on, both manual and automated, which are in place and/or required to support the relationships between the entities that make up the business." In the last few decades, several IS-architecture methods have been proposed in both industry and academia (Opdahl, 2003a).

A related term is *information architecture (IA)*, used by some authors (e.g., Periasamy & Feeny, 1997) as a synonym to 'IS-architecture', although IA can also be used to emphasize the information sharing and information management aspects of IS-architecture. Another related term is *enterprise architecture (EA)* (McGovern et al., 2004), sometimes called *enterprise information architecture (EIA)* (Cook, 1996), which, according to Chorafas (2002), "is to align the implementation of technology to the company's business strategy" and "to make technology serve innovation economics." 'EA'/'EIA' is sometimes used synonymously with 'IS-architecture', but can also be used to emphasize organizational aspects such as process structure and organizational roles.

IS-architecture alignment can also be understood as an intermediate step (or level) between ICT strategy and detailed IS planning (Brancheau & Wetherbe, 1986).

IS-ARCHITECTURE ALIGNMENT

A *good IS-architecture* should be *strategically* and *operationally fit* to the enterprise, *simple and well structured*, *well managed,* and *clearly and explicitly described*. These characteristics are explained as follows:

- *Strategically fit* means that the IS-architecture should support the enterprise in pursuit of its goals and strategies. This is of course the primary characteristic of a good IS-architecture.
- *Operationally fit* means that the IS-architecture should be integrated with the enterprise's *organizational structures*, such as its *market structure*, *product structure*, *process structure*, *function structure*, *organization structure,* and so on. Although operational fitness may not be a goal in itself, some degree of operational fitness is necessary to achieve strategic fitness.

- *Simple and well structured* means that the IS-architecture should not be unnecessarily complex, because a complex IS-architecture will be difficult to comprehend and understand, and difficult to change without unanticipated consequences. It will therefore be hard to manage.
- *Well managed* means that the principles, activities, roles, and responsibilities for IS-architecture maintenance and evolution should be well-defined and properly taken care of. An IS-architecture that is not explicitly and properly taken care of may start to drift and quickly become unnecessarily complex and/or strategically and operationally unfit.
- *Clearly and explicitly described* means that the enterprise should always document both its *current* IS-architecture and its IS-architecture *vision*. Whereas the current architecture should be represented by a sketch or blueprint,[2] the vision should additionally be documented by a set of higher-level evolution principles.[3]

IS-architecture alignment is the process of selecting such a set of higher-level principles—expressed as an IS-architecture vision—towards which the IS-architecture is to be incrementally but systematically evolved.

Henderson and Venkatraman's (1993) *strategic alignment model* distinguishes between the external and internal domains of businesses on the one hand, and between the business domain and the ICT domain on the other hand. In consequence, their framework distinguishes between *strategic integration*, which is "the link between business strategy and I/T strategy," and *functional integration*, which is "the link between organizational infrastructure and processes and I/S infrastructure and processes" (Henderson & Venkatraman,

Table 1. The core metatypes in the representation framework. For each metatype, a brief description is given, along with examples of possible sub-metatypes (from Opdahl, 2003a).

Metatype (Subtype examples)	*Description*
Goal (mission, vision, business objectives, etc.)	The motives/rationales for the **Activities** carried out by the **Organization Units** and for other **Phenomena**. ***Goals** can be either explicit statements or implicit ideas. They can be either shared or individual and either official or private.*
Strategy (business strategies, principles, plans and standards, etc.)	Guidelines for how **Organization Units** carry out **Activities**. *G**uidelines** can be either formal or informal.*
Organization Unit (divisions, business units, departments, work groups, employees, project groups, boards, committees, etc.)	One or more persons. *An **Organization Unit** can be either an individual or a group. It can be either permanent or temporary. Note that a **Role** is a subtype of **Organization Unit**, i.e., an individual unit at the type level. The **Role** subtype is so important in enterprise modeling that it should often have its own icon.*
Activity (functions, processes, tasks, some projects, etc.)	Actions or events that occur in the enterprise. ***Activities** can either be singular, continuous, or repeated.*
Information	A pattern of information or data that is used and/or produced in the enterprise. ***Information** can be on electronic or other formats, e.g., paper.*
Application	A software system that automates or supports an **Activity** in order to let an **Organization Unit** accomplish an **Goal**.
Database (electronic archives, libraries, etc.)	A collection of data or information in the enterprise. *A D**atabase** can be in electronic or other form.*
Basic Software (operating systems, protocols, etc.)	A group of cooperating programs that are used by Applications and Databases.
Computing Equipment (computers, peripherals, etc.)	A piece of hardware.
Network	A communication network that connects computers with other computers, peripherals, and/or networks.
Phenomenon	Any of the above, i.e., either an objective, a strategy, an organization unit, an activity, information, an application, a database, basic software, computing equipment, a network, or an instance of one of the extensional metatypes.