Information exchange between information systems supported by standardisation

Anders Forsman
Institution for computer science and informatic
Dalarna University
and the research group VITS
Linköping University
afm@du.se

Abstract. It is important to build systems that can exchange information with each other because information has to be communicated between systems and organisations. One important prerequisite for information exchange is standardisation. Today there is a lot of money and work spent on the development of standards to achieve information exchange between information systems and organisations. This paper will describe a number of research questions that concern information exchange and how standardisation could support it. The aim with the research is to analyse how standards can be used and implemented in information system architectures, and how an effective information exchange could be supported by standards.

1 Background and introduction

It is very important to improve information exchange (to communicate information) between information systems. Information exchange and the access of information from different systems can improve and give opportunities to develop new services with the help of information technology. One important prerequisite for an effective information exchange is standardisation. Today a lot of money is spent on developing standards to support information exchange between information systems. For example, in the field of road and transport informatics has there been a lot of money spent on standardisation. There are also a lot of existing standards that are not really used and implemented in the way that was expected. The reasons for this are that the standards are to complex and that the users of the standards do not know how to use them. The problem to use and implement standards implies that standards will not contribute to effective information exchange between systems. This also means that many system developers and managers consider standardisation more as a problem than as a supportive tool to accomplish information exchange.

In the paper I will discuss how standardisation could support information exchange between information systems and the paper has the following structure: In chapter 2 I will describe the research area and the most central concepts in my theoretical framework. In chapter 3 I will present some experiences concerning the implementation of standards based on an empirical case study. Finally in chapter 4 will describe my research question and how my research could contribute to the research in information science and to the practice of system development.

2 Research area

My research will be in the area of information systems architecture (ISA) and systems development and maintenance. In this chapter I will describe basic concepts that are important for the research and the concepts are also presented in figure 2.1 below.

Information exchange is an important concept. To accomplish information exchange you need at least two parties. One part who is acting as sender and one who acts as the receiver. In an information systems context the parties could consist of human actors, organisations and information systems. I will focus on information exchange between information systems. The information exchange between information systems is performed with the help of information that is stored in databases or communication of messages. In this context it is important to see the information exchange not only as transmission of information. The information exchange should be seen as the performance of communication acts (Austin 1979; Searle 1979; Habermas 1984) where the rules for the information exchange should be analysed from an action and process perspective (Goldkuhl G 1993).

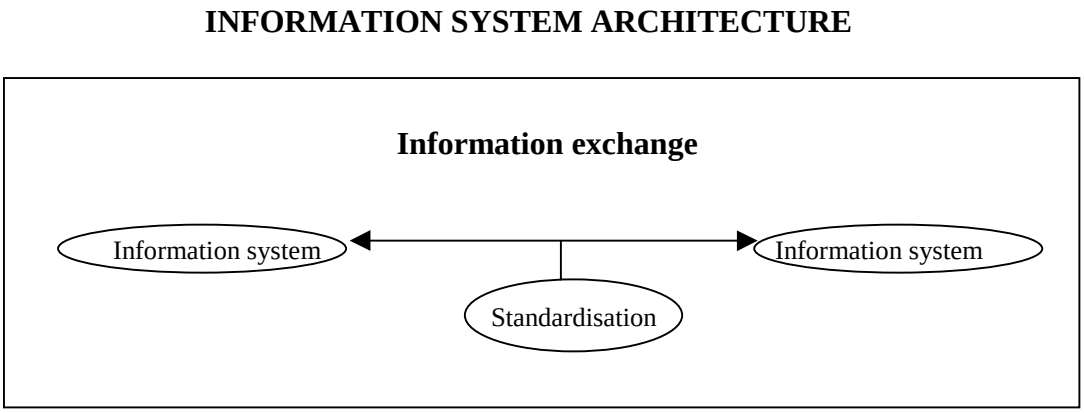

Figure 2.1 Important concepts and their relationships.

The concept of systems architectures (Eriksson, Axelsson 2000; Axelsson 1998) is closely related to information exchange. The concept of systems architecture concerns questions of how information, functionality and responsibilities should be divided, and how communication between different systems, actors and business units could be achieved. Systems architecture consists of different parts, and relations between these parts.
The systems architecture can be divided into:

1. an **information systems architecture (ISA),** which can be subdivided into a functional and an information architecture;
2. a technical architecture (TA).

An ISA consists of information, the concepts and the functionality of the applications. The applications are used to perform activities that provide services and products in a business context. The applications are used for information processing and to communicate information between different systems, actors and business units. The technical part of the systems architecture is focused on which technologies that are or should be used to implement the ISA. In my research I will focus on the ISA part of the architecture.

Standardisation or common agreements of how systems should communicate with each other are a way to promote and support information exchange. Standardisation of information exchange implies that central concepts have to be defined and identified and that the formats for the information exchange have to be decided. This implies that knowledge of standardisation and the use of standards is important for developing information systems architectures and information exchange. Standardisation is often done by special organisation like ISO (International Organisation for Standardisation), but I do not see standardisation as something that is only being done by organisations like ISO. Common agreement between different parts in an organisation, or between different organisations, can also be seen as a type of standardisation.

3 Experiences from an empirical case-study

In November 2000 I started an empirical study at The Swedish National Road Administration (the SNRA). I have been analysing information exchange between different systems with a focus on the TRISS-system (Traffic information system) that is used to provide traffic information about the Swedish roads on the Internet. The traffic information concerns accidents, road works and so fourth. The communication and information exchange between different systems that is performed in this context is based on three European standards for communication of traffic information: Location code (CEN 2000b), ALERT C (CEN 1999) and DATEX (CEN 2000a).
Location code is used to describe a specified location, and the location can be described with x,y co-ordinates or by using other types of geographical identifiers, e.g. node identifiers that refer to the road network.
ALERT C and DATEX are standardised messages that contain information about different events, e.g. a traffic accident. The events are related to a specified location, and this location is specified with the location code.
In the case study I have interviewed people that are working with systems development and user education in relation to the Triss-system. Documents that describe the standards have been analysed and how the standards have been implemented in the systems. I have also described the information system architecture with the TRISS-system in focus.
Preliminary results from the case study show the importance of using standards for information exchange, and I have found both advantages and problems regarding the use of standards.

Examples of problems that I have found are listed below:

- Standards don't describe how they could be related to each other, which is important for using them for information exchange.
- The standards are complex and difficult to understand.
- It takes long time to change standards based on practical experiences, and as consequence ad hoc solutions are used.
- Knowledge about standards can be difficult to communicate to system developers, and this implies that the standards will not be implemented in the systems.

The uses of standards have also a number of advantages for instance:

- Standards imply less systems maintenance.
- Standards increase the opportunity for information exchange between information system.
- Standards can be seen as meta rules and they can be very helpful for solving problems in the systems development process.

4 Summary

Finally in this section I will describe my research question and discuss the contribution of my research.

4.1 Research question

With the background and the practical experiences that I have presented in chapter 2, 3 above, I have formulated the following research question for my license thesis:

> **How can you succeed with the implementation of standards in information system architecture, and how can you accomplish an effective information exchange supported by standards.**

The research question can be divided into a number of sub questions that I would like to try to answer. The questions are as follows:

- What are the most important prerequisites in order to achieve information exchange between information systems?
- In what way can standardisation support information exchange?
- How can standards be made understandable and useable?
- How do we succeed with the implementation of standards?

The research will have a qualitative approach based on empirical case studies where standardisation is used as a mean for achieving information exchange between information system. The research will have a focus on information exchange that is performed in an inter-organisational context.

The theoretical analyses will be focused on theories and research in the area of information systems architectures, information exchange and standardisation.
In the empirical studies I will perform *interviews with system developers, managers and users.* The empirical case studies will also include *analyses* of information system architectures (Axelsson, Goldkuhl 1998) and information systems. Analyses of systems documentation and documents that describes standards will also be an important part of the empirical work.

4.2 Research contribution

The research will hopefully give useful contribution to research in the areas of information exchange, information systems architectures and standardisation. In the research that have been accomplished in the field of IS-architectures (Axelsson 1998; Magoulas, Pessi 1998) have not focused on standardisation and how implementation of standards could support information exchange. The research in the area of information system architecture has also had a intra-organisational focus. I will try to have an inter-organisational focus in my research. My research will foremost contribute to knowledge of how standards could be used to achieve information exchange between information systems. The research will contribute to a better understanding:

- of how information exchange could be achieved,
- of how to use standards to achieve information exchange.
- of standards and how they could be used.

References

Austin J [1979], *Performative utterances*, ur Urmson JO, Warnock GJ (Eds, 1979) philosophical papers, Oxford University press.

Axelsson K [1998] , *Metodisk systemstrukturering*, Doktorsavhandling, Linköping

Axelsson K, Goldkuhl G (1998), *Strukturering av informationssystem*, Studentlitteratur

CEN [1999], Traffic and Travel information(TTI) – TTI Message via traffic message code, prat 1: Coding protocol for Radio Data System- Traffic Message channel (RDS-TMC) – RDS-TMC using ALERT-C, (ISO/DTR 14819-1:1999). European Committe for Standardization, Bryssel

CEN [2000a], Traffic and Travel information(TTI) – DATEX traffic and travel data dictionary (version 3.1 a), European Committe for Standardization, Bryssel

CEN [2000b], Road transport and traffic telematics– TTI Message via traffic message code, prat 3: Location referencing for ALERT-C, (ISO/DTR 14819-3:2000), European Committe for Standardization, Bryssel

Eriksson O. Axelsson K [2000]. *ITS Systems Architectures - From Vision to Reality*, Accepted to: The Seventh World Congress on Intelligent Transport Systems, Turin, Italy, November 6-9

Goldkuhl G[1993], *Verksamhetsutveckla datasystem* , Intention Linköping

Habermas J [1984], The theory of communicative action 1, Reason and the rationalisation of society, Polity press, Cambridge, 1984

Magoulas T, Pessi K[1998], *Strategisk IT-management*, Doktorsavhandling, Göteborg

Searle J R [1979], Expression and meaning. Studies in the theory of speech acts, Cambridge University Press, London