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Rethinking the concept of information systems

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RETHINKING THE CONCEPT OF INFORMATION SYSTEMS'

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Introduction

The aim of this paper is to rethink the common conceptualisation of information systems in relation to constructionist and interpretivist perspectives which are present in current research on information technology and information systems. Furthermore, contemporary alternative lines of thought in IS literature are explored which may lead to an improved theoretical understanding of information systems in organizations. The complex interplay between technology and the social world or society which is reflected in our understanding of information systems is therefore the central issue in this paper. It attempts to contribute to the struggle to understand the intended and the unintended consequences of technology on society and vice versa. Managing information systems in organisations forms an interesting representation of managing our technological society.

Keywords: Information systems; definition; social issues; social systems; information systems paradigms.

Information systems as a paradigm

The invention of the computer is located in the 1940s while in the 1950s the first commercial computers were produced. The invention and early development of the computer is often said to be based on ideas and developments which can be traced back centuries (like Pascal's calculative machine and the logics of Boolean algebra). In addition, information systems in the broad sense of the word have a history which also goes back centuries, if not ages (for example King's messengers in middeaval times, Napoleon's signalposts, church archives, libraries).

The emergence of the academic field of IS, however, only goes back some 25 years to the early 1970s. After the second world-war, concepts of information and decision formed the basis for the rise of the academic fields of management science (MS) and operations research

¹This paper has been presented at the second SWEHOL working conference on "Managing our Technological Society" in Maarssen, The Netherlands, April 15- 18, 1996. It is an account of ongoing research, so all discussion and critique is welcome.

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(OR) [29]. These fields attempted to solve decision making problems by using mathematical theories and models, thereby concentrating on structured and formalizable problems [30]. OR and MS have been important predecessors to the field of information systems [1] which is underlined by the fact that many early researchers and practitioners have found their roots in OR and MS.

At about the same time, in the late 1940s, the cybernetic model was formulated by Wiener. In the opinion of Ashby, the leading theorist of cybernetics in the 1950s and 1960s, cybernetics has to do with “all forms of behaviours in so far as they are regular, or determinate or reproducible” (cited in [12]). Cybernetics aims at formulating formal rules which, can be expressed mathematically. In the 1960s Churchman proposed the systems approach in which “selection is made among alternative means of reaching a known end” [12]. It served as the philosophical basis for applying systems concepts to problems of strategy and of information systems, ideas which were further operationalized by Ackoff in the early seventies [29].

Parallel to the developments in OR and MS were ideas in organization theory literature which are relevant to the emergence of the field of Information Systems. In his attempt to describe social organization in the first half of this century, Weber formulated the theory of bureaucracy in which he discerned the formal, rational, technical and seemingly inescapable form of organization to satisfy the mass administrative needs. In the late 1950s and the 1960s the potentiality for rationality in organizations was further stressed and elaborated in the works of Simon, March and Cyert². From these times onwards, rationality in organizations was considered an ideal to be pursued by managers. The implications for information systems were inspiring, as Attewell and Rule [4] state: “Rationalization, or the relentless effort to adopt the most efficient means to established ends, is seen as the hallmark of modern organizations. Computerization is considered the most eminently rational of present-day technological trends.”.

The cybernetic ideas present in the systems approach, combined with the rationality in organization literature have formed the paradigmatic perspective in which the early 1970s conceptualization of information systems has been rooted and evolved from³. A good example is the classical program for research on management information systems by Mason and Mitroff [30] which is explicitly based on the views of Ackoff and Churchman. This paradigmatic perspective, compatible with formal logic and rational-economic control principles, could relatively easy be integrated with computer science and accounting which also stood at the cradle of Information Systems as an academic discipline. The links with so many different academic disciplines do not only depict the often praised multi-disciplinarity of the field, but it also suggest that some philosophical assumptions need to be shared. Later definitions of information systems continue to reflect the same paradigm, which is not to say that conceptualizations which did not fit this paradigm did not emerge (see below). In an

²For good overviews of rational decision making in organizations, see [2] and [37]. For an application to information systems see [27].

³Definitions of concepts and origins are based on US-oriented literature and Dutch literature. Conceptualisations as well as origins may differ among different cultural contexts. A broader overview might probably enforce the likeliness of the argument.

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attempt to integrate different models for research on information systems -including Mason and Mitroff s- Ives et al. [17] developed a more comprehensive framework in order to cover all the information systems research conducted so far. Their widely used framework explicitly incorporated different processes, different social groups and different environments, but was fully in line with its predecessors and the accompanying paradigm. Remarkably similar to Ives et al. [17] is Bemelmans' perspective [9] on information systems who might be seen as a Dutch pioneer in information systems. In the mid-1980s this paradigm can be perceived as having reached its maturity-phase with the classical textbook on Management Information Systems by Davis and Olson [13]. Their textbook which purpose is to **educate** future analysts, managers and researchers in information systems started with the conceptualization of information systems as "an integrated, user-machine system for providing information to support operations, management, and **decision-making functions** in an organization. The system utilizes computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database.". In the same year Mason [29] concluded that the "basic cybernetic framework still underlies most management information systems.". This paradigm which reflects a mechanistic way of thinking about the nature of organizations and social behaviour can still be recognized in current textbooks on information systems. Information systems, in this perspective, are seen as "complex amalgam of **metal** and plastic" [14] consisting of a number of functional components in order to satisfy transparent and pre-defined goals. In their popular MBA-textbook Laudon and Laudon [26] say that "[a]n information system can be defined as a set of interrelated components that **collect** (or retrieve), **process**, store and distribute information to support decision making, coordination and control in an organization.". Another recent textbook on Information Systems by Alter [3] tries to **teach** US that "[i]nformation systems are systems that use information technology to Capture, transmit, store, retrieve, manipulate, or display information used in one or more business processes.". These definitions reflect assumptions on the **nature** of organizations and the information systems they use, which are more the ideal-type of the **rationalistic/mechanistic** paradigm than they are a realistic and practical perspective to grasp the complexity of information systems and organizations.

The flag that covers the cargo

The title of this section is a free translation of a Dutch saying⁴ which tries to distinguish between concepts with (complex) meanings and that what is meant by it. Concepts embodied in language are a medium to express a certain framework of thought or a world view. We usually look for the right words to express our views, but sometimes it is **very difficult** to put a phenomena in its full meaning into words. For example, inventions -a product of intellectual thought- can be **very hard** to be covered by a patent, as **often** is underlined by the **many legal fights** over the actual meaning of the formulation. Over **time**, words can become indissolubly associated with meanings (or meanings with words) which in turn are part of a certain world view or paradigm. Words, equivalent to the physical flag, carry meaning which do or do not reflect what **may** be termed the subject-matter, the cargo. The moral of the saying is that a certain state of match should exist between the **concepts** used and the subject-matter meant.

⁴"De vlag dekt de lading". Normally, the saying is used in case a tempting phrase is used to gain **confidence**. A similar meaning may be found in the English saying: "Free flag **makes** free bottom".

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If a certain consensus on **scientific** achievements is reached which **provide** model problems and solutions for a time we may speak of a paradigm [23]. A paradigm holds meta-theoretical assumptions about the nature of the subject of study [11] which leaves no **space** for alternative paradigms. In this section it is argued that the concept of information system has become associated with a certain meaning which, as was described in the previous section, reflects a paradigm. Orlikowski and Baroudi [34] speak of a dominant world view in stating that information systems research “does exhibit a single set of philosophical assumptions regarding the underlying nature of phenomena being investigated”. Within this dominant world view or paradigm the concept of information system has taken on a **specific** meaning which prevents us from incorporating a number of issues and **subjects** that are relevant to the study of information systems and which are being studied in information systems literature. New ideas and attempts to extend the multi-disciplinary field with ideas and insights from different disciplines therefore face a difficult or even an impregnable barrier before being **accepted** in the information systems community. The subject-matter of information systems, as will be pointed out in the next section, has evolved and developed into a more comprehensive area than that which is covered by the conventional paradigm of information systems. In other words, what is meant to be the subject-matter of information systems research **may** not totally match with the dominant or taken-for-granted perspective on information systems.

The evolving subject-matter of information systems

Since the early 1980s there has been an increasing body of literature in IS research which challenges the common used notion of information systems and the paradigm associated with it. Though it is hard to **identify** a new paradigm, it is **possible** to **identify** a number of issues which seem to gain in importance in IS literature. Together they might mirror a new way of thinking about information systems, because “[a]ll are concerned with the **social processes** surrounding the introduction, creation, **use/misuse/disuse** of information **technology**” [34]. What is remarkable is that Orlikowski and Baroudi **don't** use the term information system in their **attempt** to grasp the **changed** subject-matter - even the word system is not used. They talk of **social processes** surrounding a technology.

In the past 10 years or so emphasis has been **shifted** from technical and rational features of information systems towards the **social** character of information systems. This **shift** in attention is more than an increased effort to study ‘people’ as a component in the traditional view, although there has been a stream of thought within information systems research concentrating on the humanist component of the traditional view on information systems, examples of which are research on user-friendliness and user-participation. The turn towards **social** issues is supported by a variety of **social** disciplines, i.e. organization literature, sociology, anthropology, technology studies, hermeneutics, which bring a variety of perspectives with them. Maybe the **shift** is best reflected in the way organizational behaviour regarding information systems is perceived. Within the traditional paradigm implementation problems, resistance to change, mis-use of information systems etcetera were seen as deficiencies which could be dealt with by (project)management. In contrast, the current **social science** perspective acknowledges manifest organizational behaviour and tries to understand it in order to understand problems in use of information systems, implementation etcetera.

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A few examples of issues which challenge the traditional paradigm may clarify the evolution of the subject-matter of information systems. A pioneering paper by Kling and Scacchi [20] heavily criticised the “highly simplified conception of computing and social life” in which the particular social context and social history are ignored. Instead they propose an approach in which the social and political context of development and use of information systems is explicitly incorporated. Development and use of information systems is embedded in a larger social and technical complex in which changes **can** be interrelated and in which the history of related changes **may** influence the new change. The attention to a larger but particular social structure in which an information system is embedded has gained an increasing support in for example cultural (i.e. [24], [16], [5]) and institutional (i.e. [21], [15]) analyses of information systems, But besides focussing on the larger surrounding or the *context* of information systems, the appreciation of the *history* of a particular social setting **also** gained popularity which is present in longitudinal or process studies in information systems (for example [7], [8], [33]). In fact, context and history are hard to separate and are **often** both addressed. Another interesting perspective on information systems stems from the attention in the 1980s organization literature to organizational power and politics [37]. It shows how the development, implementation and use of information systems **can** be closely related to the interests and goals of individuals or groups, and that information systems **can** be a reflection or a reinforcement of, or a threat to the existing distribution of power in an organization ([27], [32], [40], [22]). A last example focusses on the interpretations that people hold of information systems they **decide** about, design, work with or even study (i.e. [41]). It has been tried to identify different interpretive frameworks or “technological frames” for different social groups in order to relate this to actual social behaviour and attitudes towards information systems and other organizational groups ([35], [39]). Understanding different interpretations instead of one-best-way perspective can contribute to a better match between an information system and its social surrounding.

The distinction between (information) technology and the social setting in which it is located, which is quite similar to the division in Kling’s [19] term ‘social analyses of computing’, seems to be articulated in current research on information systems. Besides more attention is being given to the social surrounding of the technology, the technology itself has become differently perceived, mainly as a result from advances in the sociology of technology (for example [10], [31]). Technology is no longer seen as an objective, neutral and solid entity, but more as embodying subjective goals and interests, power structures and gender divisions. Technology is no external or exogene variable, but technology is the outcome of complex interactions and negotiations, it’s nature is constrained by economical, political, cultural and social factors. Technology is a product of society, it is socially constructed [38] or socially shaped [31].

The question is how to conceptually deal with the current nature of the subject-matter. Is it possible to capture subjectivity and a variety of what might be called irrational behaviour regarding information systems in a conceptual framework adapted from systems thinking? And if so, what are the philosophical assumptions on the nature of information systems, organizations and social behaviour, in other words what paradigm is adopted?

The quest for a revised paradigm?

Having identified a dominant way of thinking about information systems as a paradigm, and having described some issues of current research in the information systems area which do not seem to fit the paradigm, it is important to find conceptual solutions. This section hopes to provide some ideas, not answers, in this direction.

Hirschheim and Klein [15] have described four paradigms which are present in or could be relevant to the study of information systems in their attempt to “show that although there is a strong, orthodox approach to [information] systems development, there are recently developed alternatives that are based on fundamentally different sets of assumptions.“. The classification of paradigms they use is adapted from Burrell and Morgan [11], and consists of two dimensions or type of assumptions about knowledge and how to acquire it (epistemology), and about the social world (ontology). The first dimension is divided in *objectivist* and *subjectivist* approaches. Subjectivists pursue understanding based on the **subjective** creation, modification and interpretation of individuals, whereas objectivists believe there is one reality. The **second** dimension is divided into views of the social world as *order*, characterized by stability, integration, consensus and **functional** coordination, or as *conflict* which **stresses** change, conflict, disintegration, and coercion. The classification results in the following paradigms (see figure 1).

	Objectivism	Subjectivism
Order	Functionalism	Social Relativism
Conflict	Radical Structuralism	Neohumanism

Figure 1. Different paradigms in information systems (adapted from [15]).

Based on this classification Hirschheim and Klein describe the four paradigms as:

“The *functionalist* paradigm is concerned with providing explanations of the status quo, **social** order, **social** integration, consensus, need satisfaction, and rational choice. It seeks to explain how the individual elements of a **social** system interact to form an integrated **whole**. The *social relativist* paradigm seeks explanation within the realm of individual consciousness and subjectivity, and within the frame of reference of the **social actor** as opposed to the observer of the **action**. From **such** a perspective “**social roles** and institutions exist as an expression of the meanings which men **attach** to their world” [11, p.134]. The *radical structuralist* paradigm emphasizes the need to overthrow or transcend the limitations **placed** on existing **social** and organizational arrangements. It **focusses** primarily on the **structure** and analysis of **economic** power relationships. The *neohumanist* paradigm seeks **radical** change, emancipation, and potentiality, and **stresses** the role that different **social** and organizational **forces** play in understanding change. It **focusses** on all forms or barriers to emancipation ▪ in particular, ideology (distorted communication), power, and psychological compulsions and **social** constraints ▪ and seeks ways to **overcome** them.” [15, reference adjusted, italics added]

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The described paradigm of information systems is similar to the functionalist paradigm (cf. [15]). Issues of social behaviour located in a wider social and historical context, issues of culture and institutionalization, organizational politics, and other types of social behaviour (including the construction of technology) better fit the subjectivist side of the epistemological dimension. Therefore, it is important to search for a conceptualization of information systems which incorporates a subjective world view. A good starting point for this line of thinking might be the following definition of an information system: "... an information system is a social system that uses information technology." [25], although the question then may be rephrased as what definition of a social system should be utilized.

Furthermore, an alternative conceptualization of information systems should incorporate the dialectical relationship between (information) technology and their social surroundings [36], [28]. ISs are designed, developed, and maintained by certain social actors in certain social settings, and therefore IS are shaped by their social surroundings. On the other hand, IS support their surroundings and can have impact on and implications for their social surroundings. To understand the dynamics of information technology in organizations, our conceptual thinking about information systems should include the "unpredictable interaction between information technology and its human and organizational users" [28].

Further research should include a more extensive overview of information systems in social terms, and a search for systems definitions which match this social view of information systems. In recognizing the shortcomings of the traditional conceptualization of information systems, a search for alternative systems definitions seems to be justified. Because systems theory has evolved we might find conceptual answers, for example in sociocybernetic theory, autopoietic theory, or social entropy theory [6] or multi modal systems thinking.

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