Contents lists available at SciVerse ScienceDirect

Applied Ergonomics

journal homepage: www.elsevier.com/locate/apergo

The impact of IT over five decades – Towards the Ambient Organization

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ARTICLE INFO

ABSTRACT

This contribution to the Ken D. Eason special issue is an illustration of the value of socio-technical analysis applied at an organizational level. We provide a brief historical overview of socio-technical IS research and review studies investigating the impact of IT on organizational structures in the last five decades, identifying a dominating (new) research theme in each decade. A key overall impact of IT in all decades has been a dramatic decrease in transaction costs making it increasingly easier for organizations to source from external providers. A five level taxonomy of sourcing arrangement is developed together with a framework of organizational activities, and a number of significant cases are offered of how organizations are sourcing practically all types of business processes, including innovation. We argue that future IT will further accelerate the movement towards more sourcing, eventually leading to a new type of organization that we call the Ambient organization.

1. Introduction

Since the introduction of commercial computing in organizations in the 1950s, information and telecommunication technology (here abbreviated to IT) has been related to organizational change. This has attracted a large number of researchers contributing to a wealth of studies that investigate the relationship between IT and organizational change using a variety of research methods.

This paper acknowledges Ken D. Eason as one of the significant contributors of the socio-technical research tradition and illustrates the value of socio-technical analysis applied at an organizational level. More specifically, by adopting a socio-technical perspective such as the one he represents, we attempt to explain how the development and use of IT in organizations over time has contributed to producing significant changes to the way organizations are structuring themselves and sourcing products, services, resources as well as business processes. Based on our analysis, we argue that we have not reached a saturation point regarding IT development, nor are we likely to reach this stage in the next few decades. On the contrary, we are likely to see an accelerated development of IT, which we believe will lead to a

totally new type of organization and which we have chosen to name the 'Ambient Organization'.

The rest of the paper is organized as follows. The next section provides a brief historical overview of socio-technical information system (IS) research. In the third section, we perform a non-exhaustive review of studies investigating the impact of IT on organizations in the last four decades, identifying the dominant research theme in each decade. In the fourth section, we explain how the development of IT over time has contributed to a decrease in transaction costs, making it easier for organizations to increasingly source from the market rather than to produce internally. In the fifth section, we present a number of third party platforms facilitating sourcing before presenting a framework consisting of five different types of sourcing arrangements in section six. The seventh section discusses the future development of IT and how it can lead to the type of organization we have chosen to call the 'Ambient Organization'. The paper ends with conclusions and projections for the Ambient Organization.

2. The origins of socio-technical IS research

The socio-technical research tradition is traditionally attributed to the Tavistock School founded in 1964 with researchers such as Fred Emery and Eric Trist (Emery, 1969; Emery and Trist, 1965). Another important locus for socio-technical research at that time was the Work Research Institute (WRI) founded in 1964 in Oslo,

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Norway, with researchers such as Einar Thorsrud (Emery and Thorsrud, 1976). Using the general principles of socio-technical research, researchers were first interested in studying the relationship between production technology and organizational structure (Woodward, 1981). Later, a number of socio-technical researchers identified the enormous potential of electronic data processing (EDP), later referred to as information technology (IT), and attempted to apply socio-technical approaches to study this technology. Among the pioneers in this new research field were Ida Hoos in California (Hoos, 1961), Enid Mumford in UK (Mumford and Banks, 1967), and a young cognitive ergonomist named Ken D. Eason (Eason et al., 1975). He joined the social-technical research tradition by forming, along with other researchers such as Leela Damodaran and Tom Stewart, the small, but very effective, HUSAT research group at Loughborough University. For an overview, see also Bansler (1989), Bjørn-Andersen et al. (1979), Briefs et al. (1985), Kling (1980) and Mowshowitz (1980).

3. Review of IT impact on organizations and individuals

Since the implementation of commercial computing in the 1950s, the impact of IT on organizational structure has attracted a large number of researchers using various research methodologies to study the impact of IT artifacts on multiple aspects of organizations and individuals. This area has also been identified early as one of the core topics in information systems research (Culnan, 1987), and this stream of research is still actively pursued by numerous scholars.

The methodology applied for re-constructing the historical overview, to a very large extent, was one of an exploratory tracer approach, where every publication that typically had a number of references, was pursued. Contrary to literature surveys for the last two decades, most of the material from the early days was not electronically available; conferences and working papers provided further information.

Based on this analysis, we shall argue that the dominating research focus has changed over the last five decades in a way that each new decade can be said to introduce a new research stream. This does not mean that the old ones disappeared, as most of them continued, but each decade was dominated by a particular research design, which we identify as:

- 1960s and 1970s: IT impact on organizations and individuals
- 1980s: IT impact on organizational design
- 1990s: IT impact on inter-organizational design
- 2000s: IT impact on organizational re-invention

In this way, as we shall argue later, IT moves from being seen predominantly as an exogenous, deterministic influence to a powerful tool, useful in socio-technical design of new organizational forms, gravitating towards what we have chosen to call Ambient organizations.

3.1. 1960s and 1970s: IT impact on individuals and organizational structures

The introduction of commercial computing in organizations started in the 1950s, and from the very beginning, the potential of IT to produce changes in the role of individuals and on organizational structures attracted the attention of several researchers. For example, one of the earliest studies of IT impact applied longitudinal fieldwork to examine organizational changes associated with the implementation of mainframe computing in the 1950s (Mann and Williams, 1960). One area of particular interest was the impact of IT on organizational structures. For example, researchers speculated

on the impact of IT on organizational structures by hypothesizing that organizations would become hourglass shaped because the need for middle managers would diminish (Whisler, 1970).

However, the prime focus at that time was the impact of IT on workers. Researchers were speculating about the impact of computers (e.g., Hoos, 1960), and there were empirical investigations of the impact of IT on insurance clerks (Hoos, 1961), its influence on job content and job satisfaction of workers (Bjørn-Andersen et al., 1979; Mumford and Banks, 1967), its impact on middle managers (Robey, 1977; Stewart, 1972), and the nature and extent to which IT would create new work roles (Den Hertog et al., 1980).

Investigating the impact of IT, and especially a more specialized area called human–computer interaction (HCI) (Waterson and Eason, 2009), was also center stage for Ken D. Eason in the late 1970s. For example, he found that while more advanced systems are likely to be more flexible and useful to managers, their higher complexity can also be an obstacle to their effective and full use (Eason, 1974). Another finding was the common mismatch between the sophistication of a user's task-related information needs and its ability and willingness to make the required effort to learn how to use the computer to perform the task (Eason, 1976). As such, the biggest challenge of computer designers is to find ways of serving the needs of infrequent users with open-ended tasks without assuming those tasks to exhibit more closed characteristics than is in fact the case (Eason, 1980). To allow organizational needs to define the design of IT, a higher involvement of users is needed in the IT design and implementation processes as well as a move from a one shot technology-led implementation towards a more evolutionary way of implementing IT (Eason, 1982).

The first author of this paper had the pleasure of collaborating with Ken D. Eason on a project that was published nine years later as 'Managing computer impact' (Bjørn-Andersen et al., 1986). Technology was found not to be an exogenous, deterministic variable but a variable for which humans were able, to a large extent, to influence IT impact, for example, the desired level of centralization. Even though IT and computer systems were found to be very much the result of a design process, their eventual impact was found to be the result of more or less explicit choices taken early in the design process. Accordingly, it was argued that at any particular point in time the IT system for a given organization can have very different implications, and the concrete outcome is very much a function of design and implementation activities, as pointed out by Ken D. Eason in his book 'Information Technology and Organizational Change' (1988), which, for many years, was the textbook the first author used in his classes on the implementation of IT.

Overall, the dominating perspective in the 60s and 70s was that computers (or IT) were a powerful exogenous force that had a deterministic impact on clerks, managers and organizational structure.

3.2. 1980s: IT impact on organizational design

The number of IT impact studies grew in the 80s, with the dominating research questions changing to relate more to the impact of IT on the process of organizational design. Given the accumulated knowledge about the predominantly negative impacts of IT on organizations and individuals, practitioners and researchers became interested in exploring how IT could improve the working conditions and the design of organizations in order to make them more effective and efficient. Among the major research perspectives used in this decade, two of them could be identified as being more closely related to the topic of this paper: the so-called socio-technical perspective spearheaded by Enid Mumford (Mumford and Weir, 1979) in the Ethics method, and the political perspective largely used to study the collaboration efforts with