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The Totally Integrated Management Information System in 1960s Sweden

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Abstract: The availability from the mid-1960s of powerful mainframe computer systems such as IBM's System 360 allowed computer specialists and rationalization experts to pursue what appeared to be the logical next step in the evolution of office rationalization: from the automation of clerical routines to the automation of decision-making. This paper argues that despite the rapid diffusion of the idea of the totally integrated, firm-wide, centralized management information system (MIS) – which, besides data processing, allowed business executives real-time information on a desktop terminal – there are few real examples of MIS implementations. A survey of the MIS projects at Volvo, Saab, Asea and SAS shows that in practice these projects had limited ambitions to provide executive information, were scaled down owing to early problems and resulted in limited systems for material requirements planning.

Keywords: 1960s, Asea, big business, EDP, management information systems, MIS, Saab, SAS, Volvo

1 From Office Automation to Information Systems

The first digital computers for office purposes were used for the mechanization of clerical routines and had little impact on decision-making. Nevertheless, from the very beginning the new technology accompanied a dream of one-day extending office automation to include strategic decision-making by top management. With the arrival in the mid-1960s of third-generation computers with operating systems and improved storage devices, this prospect developed into a widespread idea of totally integrated management information systems (MIS). The purpose of this paper is to review and analyze the implementation of MIS in Sweden during the height of its popularity in the late 1960s, and to evaluate the phenomenon in the light of Tom Haigh's work on MIS in the United States [1]. The paper deals only with the particular vision of the total system that dominated the MIS concept in the 1960s. While MIS later came to represent an academic and professional field as well as more limited executive information systems (EIS), we will not address these here. The paper is based on contemporary business and computer press, complemented by oral history evidence and deals with, in turn, the context in which MIS emerged; which Swedish firms embarked on efforts to develop total information systems; the outcome of the implementations; the question of who promoted MIS; and its historiographical legacy.

According to Haigh, many systems developers and management scientists in the 1960s had a common vision of “a comprehensive computerized system designed to span all administrative and managerial activities. While the lower level of this gargantuan information system would process the payroll and bill customers, its upper levels would provide executives with constantly updated forecasts and models of their company’s position.” With that, the “computer’s role had been transformed, rhetorically at least, from a simple clerk-replacing processor of *data* into a mighty *information* system sitting at the very heart of management, serving executives with vital intelligence about every aspect of their firm’s past, present, and future” [1].

Technologically, the MIS concept linked closely to the appearance of more powerful mainframe computer platforms in the mid-1960s, notably IBM’s System 360. The majority of larger and medium-sized corporations were likely to have first encountered computer technology in the form of second-generation digital computers like IBM 1401, a transistorized computer with substantially higher performance compared to its predecessors. However, second generation computers had a number of limitations which mostly limited their application to batch data processing tasks: input was based on punch cards, output consisted mostly in printed reports, and magnetic tape with long access times was the usual means of secondary data storage. Third generation computer systems allowed direct-access storage devices and multiprogramming, and they set the stage for new visions of integrated information systems, spanning the entire organizations and extending the application from the operative to the strategic level [2].

In terms of ideas, MIS represented the continuation of a longstanding desire to improve productivity through rationalization and in particular automation. Whereas rationalization had previously been mainly concerned with the shop floor, from the 1950s, attention increasingly turned towards the office. In the 1950s, a popular keyword was integrated data processing (IDP), implying that data entered into a system of electromechanical or electronic data processing machines and transferred on punch cards or paper tape between machines, and even between offices using telex. As Haigh has pointed out, “MIS was IDP writ large, emphasizing better decision making rather than operational efficiency and applying techniques from operations research to transform mere data into managerially relevant information” [1]. Unlike the visions of 1950s, scholars such as Herbert Simon, Thomas Leavitt and Harold Whisler, MIS did not imply the automation of management decision-making, but the provision of information to management.

The course of events in Sweden had a lot of common with those in the United States. Electronic data processing (EDP) was introduced in the mid-1950s, beginning from 1956 with the installation of digital computers in a number of insurance companies, insurance being a very information- and transaction-intensive industry [3]. The first digital computer for office applications in Sweden, the IBM 650 machine at Folksam, was used for calculations related to life insurance, for motorcar and life insurance statistics, and for some of the office work involved in motorcar insurance previously carried out by means of conventional punch card machines [4]. The introduction of EDP in Sweden coincided with hype for the keyword automation, which promised something far more advanced than mere mechanization [5]. According to a leading expert on office technology in 1960, with EDP, one could not only “process large quantities of paperwork at a fantastic speed”. More significantly,

one could “provide management with concise, absolutely fresh information about the market situation and the firm’s position from the point of view of accounting” – thus returning some of the managerial control which had been lost during the growth of complex organization in the twentieth century [6]. EDP advertising for computer suppliers and service bureaus around 1960 displayed images of business managers accompanied by slogans like “if one only had the facts,” or “I get the statistics while they are still relevant.” Thus, by the late 1950s, the vision of the fully automated office had begun to spread in Sweden. The idea was usually not automating decision-making per se, but rather automating the provision of information for managers (just as described by Haigh). For a commentator in 1958, the internal functions of the firm would remain “to mechanical brains and mass producing machines” [7]. Machines would gradually replace clerical office personnel, whereas managers remained with access to superior data for control and management of the firm. This would result in the rise of a new professional class, namely that “brain trust” which was to be in charge of the programming and development of automation [7]. The hope for automated information provision was inspired by the recent success – or at least publicity – of the new discipline of operations research, loosely defined as “a scientific method for the provision of the basis of decision for top management” [8, 9]. Rather than a coherent set of methods or techniques, operations research was a generic term for a set of rather disparate techniques, including Monte Carlo experiments, queue theory, linear programming and game theory.

2 Third Generation Computer Systems and MIS

By the mid-1960s, the arrival of third generation computer systems, operations research, and the vision of taking automation to the strategic level had merged into a particular vision of the management information system. The term management information system has later taken on several different meanings. In the mid-1960s, it was strongly associated with a rather particular vision of a totally integrated, firm-wide information system that allowed the managing director (and sometimes his vice presidents) to access current information about the firm, preferably from a terminal on his desktop and in real-time. Using the terminal, the manager could access up-to-date information from the firm’s data bank and run simulations that allowed him to improve decision-making.

Turning from the realm of ideas and to business practices, a salient aspect of MIS is the rarity of attempts to implement such systems – at least if we keep with the narrow definition of a totally integrated system. In practice, only a small number of the biggest and technologically most advanced firms in engineering and financial services endorsed MIS. At Volvo, the transport equipment manufacturer based in Gothenburg, an explicit attempt to develop a MIS entitled “Volvo Information System” (VIS). Volvo initiated it in 1964, formalized it in 1967, and ultimately discontinued it in 1972. VIS was to integrate twenty major application areas such as construction data, materials and production control, and payroll. The initial budget was SEK 30 million and 300 person-years. At the electrical engineering giant Asea in Västerås, an effort to develop an Asea Management Information System (AMIS) was

undertaken marginally later than the project at Volvo, but it did not really take off. At the aerospace, motor car, and electronics firm Saab in Linköping, TIPS (initially shorthand for “Totalt Informationssystem På Saab,” later for “Totalt Informationssystem för Produktions-Styrning”) was initiated as a preliminary study in June 1967 and led to a four-year development plan by 1969 [10]. In the financial services sectors, there were also some attempts at totally integrated systems such as TOBA (TOtal BANKsystem) at the savings banks service bureau Spadab, conceived as “a total bank system with complete integration.” TOBA was one of the first online systems in Sweden driven by visions of the local savings bank manager retrieving information and running simulations on a terminal [11]. The airline company SAS did not endorse the MIS discourse, but it probably came closer to building an integrated total information system than any other Swedish firm. In 1963, on the recommendation of a department dealing with efficiency and rationalization, the SAS management decided to join all computing into a single department with offices in Copenhagen and Stockholm. SAS Data then produced an EDP Long Range Plan (ELOP), which had no explicit ambition to provide management information but in practice went further than attempts elsewhere in integrating subsystems and databases. Raine Dahlberg, at the time responsible for long-range planning at SAS Data, recalls an early decision not to aim at a “well-developed and integrated MIS system,” but rather to present a set of ten different monthly Management Information Reports, MIR. [12, 13]

It is evident that the firms in question were the largest and technologically leading enterprises in Sweden. In 1964, ASEA and Volvo were the biggest groups in Sweden in terms of number of employees and Saab ranked ninth [14]. Just like SAS they moreover belonged to the top in terms of being technologically advanced. MIS was essentially a big business concept and it is debatable whether many more Swedish firms were big enough to qualify. Certainly, many other firms initiated large information systems around the same time, but few met the typical description of MIS in the trade journals – the total integration of data processing into a system providing information for top management.¹

3 MIS at Volvo, Asea, and Saab

Since there is not enough space here to describe the individual projects in detail, instead I will present three main themes that characterize the Swedish MIS endeavors. First, although the provision of management information was often mentioned in presentations of the various MIS systems, in practice the implementation of MIS was guided by other organizational objectives. VIS was primarily “a large scale effort to integrate the many diverse applications of data processing within the Volvo company” [15]. Around 1964, Volvo ran the risk of ending up with four different incompatible computer systems within the group. In addition to the IBM machines in Gothenburg and the Saab D21 at Trollhättan, there were plans to purchase a Bull Gamma 10 at the

¹ These firms include the steel company Fagersta and the forest and paper company SCA.

Köping plant and a Univac system at Skövde. The head of systems development, Karl-Henrik Hübinette, and the head of operations, Anders Svedberg, notified vice president Per Ekström who in turn referred the issue to Stanford Research Institute (SRI). SRI strongly recommended a centralized data processing system for Volvo and in response to the SRI Report, Volvo set up Volvo Data as a separate subsidiary responsible for all data processing in the group (except Trollhättan) [16]. The TIPS project was motivated by the intention of Saab's top management to decrease the dependence on the Swedish Air Force and expand the firm's activities in the market for civilian products, which required a makeover of administration. Moreover, there was a desire to substitute Saab's own D22 mainframe computer for the existing IBM 7070/1401 and Saab D21. Cost savings remained a very important rationale for TIPS, through savings on the materials flow, operational control, and administrative personnel [17].

Second, the MIS projects ran into problems and they scaled down soon after initiation. VIS was off to a slow start in 1964 since the formation of Volvo Data and systems development for the new Torslanda plant in Göteborg took up most of the available resources. Around 1967, they formalized with a steering group and a project group (which met on neutral ground in Laxå, roughly equal distance from the various Volvo sites). It soon became apparent that the centralization effort underlying VIS ran counter to a wider trend in the Volvo group towards a more decentralized structure, with Passenger cars, Lorries, and Buses becoming separate subsidiaries within the group in 1969. VIS was scrapped in 1972, although many of the subprojects lived on as separate systems and VIS may have led to more systematic procedures for data processing and analyses and investigations useful in later stages [18]. As for AMIS, after about a year the project reduced to a three-person mapping of the operative functions at Asea. The resulting table showed that most of the relevant functions were difficult to integrate into a centralized system [19].

Third, what in the end came out of the MIS systems development consisted largely of systems for materials and inventory control, and to some extent production planning. These systems led to a certain degree of automation of decision-making and improved statistical data, but not at the strategic level implied by the MIS vision. At Volvo, systems for spare parts and inventory control were at the heart of data processing in general as well as the MIS modules. TIPS resulted in the projects MOPS (Material- och Produktionsstyrning) and IOL (Inmatning on line av ekonomitransaktioner) [18]. AMIS was downscaled to address specific problems of materials control, where the problem of lacking centralized control was most obvious, and they relabeled it CM (Centralt Materialstyrssystem), Central Materials Control System [19]. At SAS, MOPS (Maintenance and Overhaul Planning System) alone required some four hundred person-years of systems development and programming work; MATS (Material Supply and Inventory Control) was another major effort in the 1960s [12, 13]. The focus on materials and inventory was not coincidental. It matches the findings of contemporary investigations of computer use in Sweden [20]. Indeed, these areas correspond to those where operations research had first found its main applications in the 1950s [21]. Moreover, the eventual emergence of enterprise resource planning (ERP) systems in the 1980s owed a lot to the preceding developments in materials and production planning.

4 Explaining the MIS Legacy

Technical systems never materialize unless powerful groups of actors conceive, endorse, and promote them. In the case of MIS, Thomas Haigh has claimed that a particular professional group spread the idea: the “systems men” of the Systems and Procedures Association (SPA). Although systems men were often systems developers or other computer specialists, they were also “an alliance of staff specialists in administrative methods, management consultants, and business professors, who were all seeking to legitimate themselves as technical experts in management” [1]. For Haigh, the prominence of MIS in 1960s management discourse and (to a somewhat lower degree) practice was the outcome of the endeavors of this professional group. They tried to establish their jurisdiction “over the burgeoning world of corporate computing,” to improve their status from clerical specialists to a key function in corporate management, and to extend their control into new domains, such as management reports, organizational restructuring, and strategic planning [1].

In the Swedish context, it is difficult to identify an equivalent of Haigh’s systems men. In Sweden, systems men as a professional category emerged only with the onset of data processing. Specialists in administrative methods were like a subcategory of general rationalization expertise – implying a very strong focus on time and motion studies – and organized in the Swedish Rationalization Association. As a rule, the time study men did not find a place in the increasingly computer-oriented offices of the 1960s. Computer specialists instead emerged as a new group organized in the organizations *Svenska Dataföreningen* and *SSI*, which do not appear as major promoters of MIS. Neither do leading management science scholars with an interest in computing. Börje Langefors at the Royal Institute of Technology, the first professor in information processing in Sweden and a doyen of Swedish computing, was critical because of the difficulty of defining a total-optimal objective for such a system [22, 23]. The idea that management control was too elusive to be part of a system seems to have been widespread. In 1969, Sam Sjöberg at the Gothenburg School of Economics, one of the most frequent commentators on MIS, talked about “the propaganda for ‘On Line Real Time Management Information Systems’ promoted by machine vendors and other should be met with a no mean measure of skepticism” [24]. Olle Dopping, another leading information scholar, mentioned MIS in 1972 as “the pompous piling of one prestigious word after another” [25].²

In all likelihood, the MIS vision derived largely from the United States and it transferred to Sweden through the written work of management scientists and the activities in Sweden of computer supplier and management consultants. The Swedish MIS firms studied above have in common a substantial reliance on IBM as supplier of computer equipment and on Stanford Research Institute in helping to organize the firm’s reorganization, long range planning, and centralization of systems development and data processing facilities. While MIS partly represented a continuation of ideas of earlier domestic origin, these American influences were decisive in bringing about the MIS projects. SRI gained a very influential position in Sweden through the

² There were certainly more enthusiastic voices, such as Hans B. Thorelli, Walter Goldberg at the Gothenburg School of Economics.

intermediation of the industrialist Marcus Wallenberg, who was chair of the board of SAS and ASEA at the time.

MIS as a term did not disappear in the early 1970s, but it received new life by the formation of the Society for Management Information Systems and its journal *Management Information Systems Quarterly*. However, the term now carried a different and more fragmented meaning, as an academic discipline or as a general framework for information systems development. Only in the 1980s, other terms replaced it like “decision support systems” or “executive information systems.” However, in its late 1960s totally integrated version, MIS never achieved realization. According to Haigh, “there is no record of any major company managing to produce a fully integrated, firm wide MIS during the 1960s, or even the 1970s – still less one that included elaborate economic forecasts or linked suppliers and producers” [1]. The Swedish record tells a similar story, with even fewer attempts at building MIS systems.

Yet, the “MIS period” had left behind a negative legacy often mentioned in historical overviews of systems development in Sweden. According to a 1978 handbook in industrial production, “some of the biggest Swedish enterprises invested a couple of millions in management information systems (MIS) and discontinued the projects as they were approaching implementation. The computer fell into disrepute and there was a computer backlash in the line departments” [26]. An overview of accounting systems in Sweden, also from 1978, claimed, “the failed management information systems in large corporations in the 1960s has led to a more cautious coordination of different modules into coordinated accounting systems in the 1970s” [27]. Similar passing statements about the existence and legacy of MIS in Sweden are not hard to find in the literature [28]. It is quite possible that MIS in these statements has become a symbol of a wider tendency in the 1960s towards centralization in corporate computing – or in planning more generally for that matter – and in particular the centralization of computer facilities and control of information systems to the computer departments.

This overview of MIS implementations in Sweden has shown that the totally integrated management information system in practice was a rare phenomenon. Based on the few implementations, it hardly deserves the attention it has attracted and it may seem surprising that the MIS era in Sweden received stature by latter-day commentators. Nevertheless, MIS was always more of an idea than a practice, and the Swedish discourse of the late 1960s and early 1970s closely interlinked with the discussions of leading computer specialists and management scientists in the United States.

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