

The Evolution of Accounting Information Systems

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Abstract

In recent years, the increasing adoption of digital technologies have dramatically accelerated the speed of change in the accounting information systems (AIS) domain. However, AIS go back centuries. This chapter provides a brief summary on evolution of AIS, from when the first rudimentary versions of AIS were adopted to the information age with the adoption of mainframes and ERP systems to the present with the increasing adoption of business intelligence and data analytics capabilities. The technological development of AIS is also discussed in relation to how the role of accountants has changed over time.

Introduction

Accounting is typically seen as a slow-paced and conservative industry. Despite such a reputation, the accounting discipline, and the role of accountants, have both changed significantly over time (Baldvinsdottir et al., 2009; Kokina et al., 2021). Boyns & Edwards (1997a, p. 21) state that “accounting is a discipline which may be seen, at a particular point in time, to encompass a body of ideas, a number of conventions, a set of available tools/techniques and a variety of actual practices”. All these components are embedded in a system, which takes the name of Accounting Information System (AIS). The scope of AIS has expanded in tandem with the role of accountants as a consequence of technological developments that have shaped how accountants perform their work. AIS have expanded from mere record keeping systems, to complex systems encompassing technical, organisational, and cognitive factors (Mauldin & Ruchala, 2009). AIS are not used only by accountants, but also by other decision-makers within organisations who need to make their decisions based on accounting data, as well as in tasks that involve an application of accounting data (Reneau & Grabski, 1987).

Among the available definitions¹ of AIS in the literature, this chapter adopts the one proposed by David et al. (1999) who define AIS as a discipline:

“that captures, stores, manipulates, and presents data about an organisation's value-adding activities to aid decision makers in planning, monitoring, and controlling the organisation.”
(David et al., 1999, p. 8)

¹ See for example the ones suggested by Belfo & Trigo (2013) and Poston & Grabski (2000).

This definition is preferred over the others because of the following reasons. First, this definition of AIS does not make any reference to information technology per se. Therefore, it fits particularly well in a discussion about the evolution of AIS, which is the aim of this chapter. Readers should not be confused between the terms *information systems*, and *information technology* since they are not synonymous; furthermore, the former does not imply the latter as information systems existed well before the development of computers (Alikhani et al., 2013). Information technology, on the contrary, is simply a use of computers to manage information systems. Thus, considering AIS only as computerised systems, or simply information technology, would underestimate the extent of changes occurred over time. Second, the definition proposed by David et al. (1999) refers to the essential role of AIS, which is to provide both internal and external decision makers with timely and valuable information about the organisation. Although the essential role of AIS has been substantially untouched, the extent to which such information has been used to monitor, control or plan an organisation's activities has changed over time leading to a change in AIS design (Anandarajan et al., 2004).

Leitch & Davis (1983), identified four main drivers behind the evolution of AIS:

- *Information requirements*. Information needs can be classified in two categories, i.e. *internal* and *external* information requirements. Internal information requirements have been growing over time due to the increase in firm size and business complexity, as well as changes in ownership structure. For example, a merchant, who runs a local business, has lower information requirements than a firm with offices in many different countries. External information is mostly related to financial reporting. Regulators in different parts of the world have substantially increased the information a firm has to disclose in order to enhance the informativeness of financial statements, which thereby increases a level of investor protection.
- *Technology development*. AIS do not always imply the use of computers. However, it would be hard to imagine modern information systems without any support from computers (i.e. information technology). Information technology has been gradually introduced to aid AIS in many aspects. The first computerised AIS were adopted to handle day-to-day operations in large organisations. Many technological developments have led to increasing computing power and rapidly decreasing cost, and the invention of the Internet led to quantum changes within AIS. Recently popularised technologies such as Artificial Intelligence (AI) (Sutton et al., 2016) and Robotic Process Automation (RPA) have dramatically increased the speed of change within AIS (Kokina et al., 2021).
- *Systems approach*. The systems approach is a way of structuring and coordinating the activities and operations within an organisation. This approach is based on the idea that different parts of a system may, and should be, interrelated so that the value of the system as a whole is greater than the sum of its components. The systems approach is clearly visible in modern AIS, but it was extremely challenging to put it into practice prior to the 1990s, when the enterprise resource planning (ERP) system was invented. Back then, AIS typically did not interact with any other information systems adopted in other departments, and vice-versa. The systems approach was a result of the integration need that emerged inside companies that had grown substantially in terms of size and complexity. With the systems approach, AIS started to provide timely performance feedback to other functions.

- *Scientific approach to management.* The application of mathematical, statistical, and advanced analytical models for Big Data, to organisational management has significantly increased the complexity of AIS. As a response to the growing complexity of companies and the business environment, AIS are required to handle increasingly larger volumes of data in different format as well as to integrate, manipulate and analyse this data. As a result, AIS have experienced a constant increase in the number of tasks they can execute and in their performance.

The innovation process in the AIS domain has been anything but linear and this chapter aims to describe these main stages in this evolution. In a similar attempt, Anandarajan et al. (2004) divide the AIS history into five periods: Ancient Times, Pre-RenAISance, RenAISance, Industrial Age, and Information Age. The characteristics of the first four periods are briefly summarised in the next paragraph (i.e. *where it all began*). This chapter extends the discussion on the post-1950s era divided in three main phases i.e. the *Information Age* (1950s – 1980s), the *Integration Phase* (1990s), and *AIS 2.0* (2000s – present).

Where it all began

The first example of AIS can be traced back to ancient Jericho around 8000 BC where merchants kept track of their inventories and transactions using tokens (Anandarajan et al. 2004). For 5,000 years, there were just small improvements until the advent of the abacus (Brown, 2014). Originally invented in China, the abacus made its way to western civilisation and became a valuable tool for accounting calculations. Around the same time period in Egypt and Mesopotamia, accounting transactions were being recorded on papyrus rolls and clay tablets. The role of these rudimentary AIS consisted only in ‘list making’ with transactions being recorded in terms of items exchanged. Three major changes then occurred and changed the course of accounting practices. First, the invention of banking and coins attributed to the Greeks (575 BC) that enabled commercial transactions to be recorded in money instead of weights or other measures (De Soto, 2009); second, the development of a basic income statement and balance sheet in ancient Rome (Anandarajan et al., 2004); and third, the development of an initial concept of corporation (Brown, 2015). Roman authorities introduced a regulated system of accounting and taxation and merchants were required to “register” their business and report profits for taxation purposes.

During the Middle Ages there was a period from 1000-1200 that saw small incremental advancements in the AIS field. The Normans invented the tally stick, which displayed the equivalent of accounts receivables and payables in our modern financial statements (Anandarajan et al., 2004). Italian merchants improved single entry bookkeeping practices to effectively manage the increased number of transactions generated by the Crusades (Gleeson-White, 2011).

The period between 1250 and 1350 saw the so-called *commercial revolution* (Bryer, 1993). During those years, merchants’ businesses grew so significantly that they started to create partnerships in order to address their funding needs. Furthermore, between 1400 and 1600 large

joint-stock companies² emerged to fund transoceanic expeditions. For the first time there was a real separation between owners and managers. In such a context, efficient and reliable AIS were essential to ensure transparency between investors (owners) and administrators (managers), and to make appropriate decisions for the benefit of the companies. In contrast to single entry bookkeeping, double-entry bookkeeping³ did not only allow transactions to be measured and recorded, but it also explained how the profit and loss statement, and balanced sheet were generated (Littleton, 1933). The enhanced level of transparency and accountability increased the level of trust in commercial and investment ventures. Thus, investments in commercial and other financial opportunities increased and enabled further economic developments.

It was during the industrial age (1700-1940) that double-entry bookkeeping gained importance on a global scale (Hoskin & Macve, 1986; Anandarajan et al., 2004.). This period was also characterised by a significant change in AIS. AIS had to provide more information to both external and internal stakeholders. With the separation between ownership and control becoming more common in different industries (Johnson and Kaplan, 1987), financial reports had to provide owners with complete and reliable information about how financial results were generated. At the same time, internal stakeholders were constantly looking for mechanisms to reduce inefficiencies in the production process (Fleischman & Tyson, 1993). AIS had to support management activities by providing more granular information about the production process and relevant performance measures. This gave rise to a new accounting field known as management accounting⁴. Management accounting is closely related to the development of scientific management; the main concern is to identify and understand costs for the purposes of control. AIS had to be adapted to manage the increased volume of information to be processed. The same logic adopted for other operating processes was applied to AIS where the workflow was divided into minute operations performed by a worker or by a small group; in this way the performance of each worker and process could potentially have been controlled by mathematical checks. Despite all the changes to AIS up to and during the industrial age, the impact of technology in the office was mostly confined to various forms of office mechanisation (i.e. typewriters). It was the so-called information age that represented a turning point in AIS development.

The information age: 1950s to 1980s

The information age spans a 40-year period in which there were many technological developments. For ease of reference, the information age is divided into two distinct phases: the *mainframe phase* (1950s – 1960s), and the *personal computer (PCs) and decision support system (DSS) phase* (1970s – 1980s).

² A well-known example of joint stock company is the East India Company founded in 1600 (Lawson, 2014).

³ The origin of double-entry bookkeeping is uncertain. However, it was attributed to an Italian mathematician whose name was Luca Pacioli who wrote, in 1494, the treatise *Summa de Arithmetica, Geometrica, Proportione et Proportionalitate* where he explained how to effectively and efficiently record financial information.

⁴ Sometimes management accounting is also referred to as cost accounting. It emerged in Britain around 1870s (Boyns & Edwards, 1997b).

The *mainframe phase* started with the development of the first computer with electronic circuits which were developed by Eckert and Mauchly in 1943. A decade later, IBM released the IBM 702 Electronic Data Processing Machine. The machine's ability to process large amounts of data and handle alphanumeric variables of varying size made it suitable for accounting workloads. Thus began a revolutionary phase in AIS history (Anandarajan et al., 2004). At this time, the main role of computers was to improve the efficiency and accuracy of manual accounting work performed by accountants in voluminous and repetitive accounting activities such as inventory tracking, general ledger, account receivable/payable, and payroll. The traditional role of accountants was to summarise transactional details of how a business operated in a past period, but this time with an aid from computerised AIS. AIS were no longer operating through faith in accountants and their locally developed manual routines, but through faith in computers (Baldvinsdottir et al., 2009). Despite the slowly growing importance of computerised AIS, their functions were limited to routine data gathering and processing. The introduction of computerised AIS had three main impacts. First, speed and volume increased rapidly with the introduction of machines in the accounting function. Managers could introduce new methods for performance monitoring and management control. For example, *management by exceptions*, a practice in which only a significant deviation from a budget/plan is brought to the attention of the management, was made possible by computerised AIS (Brownell, 1983). Second, there was a swift change of skillsets required for senior accountants. Before the introduction of computers in the AIS function, senior accountants had only needed to perfect the art of manual-based AIS. With the introduction of computers in their work routines, senior accountants faced a dual role of running not only the AIS, but also the computer system so that the traditional manual-based AIS could work in perfect harmony with the computerised system (Anandarajan et al., 2004). Demand for senior accountants was high and they were in a strong position to negotiate higher salaries. Conversely it had an adverse impact on junior accountants. This is the third point that we will now discuss. The introduction of computerised AIS meant that basic accounting clerks were no longer required and were made redundant since the work was more efficient and effective when performed by computers than humans. Only simple tasks like data entry were left to junior accounting staff. For example, a US based multi-branch bank reported a 75 percent reduction of book keeping staff within the first 18 months of an electronic bookkeeping machine installation (Braverman, 1974). The typical *bean counter role* of the accounting profession, who provided only transactional and historical information of the business, was eroded for the first time. Despite the undeniable benefits that resulted from the introduction of mainframes, the adoption rate was initially extremely low. By 1955 there were only about 240 mainframes in use in the US (Campbell-Kelly & Garcia-Swartz, 2009). The main reasons for such a low adoption were the complexity of such systems and high investment required.

The 1970s marked the beginning of the *PCs and DSS* phase. By this time, the number of companies adopting computerised AIS had begun to increase. The turning point was the development of personal computers (PCs) and accounting software, which first became available during that period. With personal computers, the investment required to adopt computerized AIS fell dramatically. The MITS Altair 8800 was the first PC to be introduced to the market in 1975 at a retail price between USD 275 and USD 395, followed by the Apple

I in 1976 at USD 666.66 (ComputerHistoryMuseum, 2016). In comparison, the cost of mainframe computers was around USD 4.6 million (Perry, 2007). Such a low cost represented a significant incentive for companies to adopt PCs in their daily activities. The software side grew along in harmony. The *ICP Quarterly* in 1974 listed 324 accounting software packages available in the market for core accounting functions such as general ledger, account receivable/payable, billing, budgeting and costing within the a price range of USD 5,000 – 8,400 (Campbell-Kelly, 2004).

The following decade saw the emergence of the *business controller role* within the accounting profession. The significance of this role grew over time (Baldvinsdottir et al., 2009). In this role, accountants are thought of as business advisors who analyse accounting data and provide guidance to middle management on how best to make a business decision at a strategic level. It should be noted that the 1980s marked only the very early onset of the business controller role. It was not until the 1990s that technological advancements, like the ERP system, which will be discussed in the next section, were developed enough to fully support accountants in this role.

To aid the early but steadily growing business controller role, a new kind of computerised AIS called the *decision support system (DSS)* was invented (Baldvinsdottir et al., 2009). DSS is a term that refers to any kind of computer system that can be used to support complex decision making and problem solving (Shim et al., 2002). Many kinds of DSS are identified in the literature, such as (1) data-driven DSS, (2) model-driven DSS, (3) knowledge-based DSS, (4) communication-based DSS, and (5) document-driven DSS (Alter, 2004). The relative importance of a particular type of DSS compared to the others depends on how decision-makers use the systems in question to support decisions at hand. For example, to perform a sales forecast for the next quarter, an accountant might need access to all kinds of DSSs for information about past sales, current knowledge about the macro economy and insights about a particular market. This data and information could be located within a number of different DSS.

One of the software revolutions that marked the DSS era of the 1980s was VisiCalc, the first electronic spreadsheet software that was launched in 1978 (Cunha et. al., 2015). VisiCalc played a significant role in transforming the perception of PCs into that of a useful business tool. It had most of the features of electronic spreadsheets available on the market today, e.g. a column/row tabulation program with a *What You See Is What You Get (WYSIWYG)* interface, a cell reference (A1, A2 etc.), and recalculation of formulas (Mendes, 2012). An electronic spreadsheet provided an excellent platform to perform a what-if analysis, which involved combining historical accounting data with up-to-date facts and knowledge, to forecast how a future business condition might play out. A simulation of several different business conditions (e.g. best-case, most-likely case and worst-case scenarios) could be run through electronic spreadsheets and possibly through other statistical software. Despite the gradual growing significance of the business controller role, the role did not dominate the AIS landscape until the 1990s, as the technology required to support decision-making tasks was not fully

developed. For example, VisiCalc was only the first attempt at a DSS consequently much manual work was left to accountants, particularly manual data entry into spreadsheets.

In summary, the information age can be divided into two main phases. The initial *mainframe phase* (1950s – 1960s), in which AIS ran on complex mainframes adopted by a limited number of big companies, and the second - *PCs and DSS phase* (1970s – 1980s) - in which revolutionary technologies, such as PCs and electronic spreadsheets, gradually reshaped AIS.

The integration phase: 1990s

The 1990s was a decade of great volatility in the global economy. Developed countries experienced rapid economic growth from international trades, but there were also many major financial crises in several parts of the world (Nankani, 2005). In terms of technological advancement, many key IT developments were invented during this period to aid computerised AIS. The Internet, data warehousing and ERP systems are some key technologies that define the computerised AIS landscape of the 1990s (Rashid et al., 2002). These technologies were complemented with advancements in cost and management control techniques, which were highly popularised throughout the decade (Meyer, 2003). These include activity-based costing (ABC) (Cooper and Kaplan, 1991), and balanced scorecard (BSC) (Kaplan and Norton, 1995). All of these challenges – macro economic conditions, technological advancement, along with advanced cost and management control techniques – required accountants to integrate all of these aspects together into their work function. That is why we labelled this decade as the *integration phase*.

The 1990s posed significant challenges to accountants. These included the increasing globalisation of business (Nankani, 2005), tighter controls imposed by ABC and BSC, and growing business uncertainty as signalled by various financial crises worldwide (Nankani, 2005). Accountants faced such challenges by adopting the new IT tools and management accounting techniques, which became available during those years. There was also a shift in the role of accountants. The *business controller* emerged as the dominant role over the *bean counter* role. The business controller role, which was first introduced during the 1980s, was fully developed by the start of this decade. This progressive expansion of the business controller role in the 1990s was primarily due to the arrival of the ERP system. The remaining part of this section will explain the impact of ERP systems on the changing role of accountants.

An ERP system is, in essence, an integrated cross-functional business support system (Grabski et al., 2011) that is often available *off-the-shelf* and ready to be implemented in any business organisation. ERP systems comprise of functions (or *modules* as they are commonly referred to in the business literature) that correspond to a function or department within an organisation. Common functions that were available in a typical ERP package in the 1990s consisted of: (1) Financial Accounting, (2) Managerial Accounting, (3) Human Resources, (4) Supply Chain Management (SCM), (5) Project Management, and (6) Customer Relationship Management (CRM) (Rashid et al., 2002). To achieve these all-in-one functions through the use of a single software, the ERP itself is comprised of four key layers. An elaboration of these layers allows

us to understand how the ERP system integrates with other key technologies of the 1990s, like a data warehouse and the Internet, to make a strategic impact on organisations (Kale, 2016; Møller, 2005; Paulsson, 2013). The four layers of the ERP system consist of:

- *The foundation layer* is built upon data warehousing technology. It provides an integrated database for different modules and outlines an application framework to make ERP modules work together in perfect harmony.
- *The process layer* provides core transaction-based functions of the ERP system such as financial accounting and material and production planning. These are the core components of the earliest ERP systems (Rashid et al., 2002).
- *The analytical layer* combines transaction data in the process layer with other databases, which might not be directly synchronised with the core-integrated database in the foundation layer, to provide a decision support system to users. The Internet, and other network technologies in the 1990s, like local area network (LAN) and wide area network (WAN), are the main technologies that make the connection between different databases possible. Modules like SCM and CRM are the hallmarks of the analytical layer.
- *The e-business layer* utilises Internet technology to provide electronic collaborations with other business parties outside an organisation, such as customers, business partners, and employees. The layer enables the ERP system to integrate with other business systems through enterprise application integration (EAI) technology.

The ERP system in the 1990s had fully working foundation and process layers, but it also started to embrace the analytical layer into the overall ERP design. However it was not until the 2000s that the analytical layer was fully commercialised, and the e-business layer started to take off (Møller, 2005). The next paragraph provides further details about these more recent developments.

The ERP system of the 1990s played a significant part in supporting the business controller role. To effectively utilise an ERP system, all business processes must run according to an accepted industry standard, regardless of location and local cultures – this is commonly known as *best practice* (Hong & Kim, 2002). In any ERP implementation, best practice is required in conjunction with the technological part of the ERP system in order to improve process efficiency (Hong & Kim, 2002; Wagner & Newell, 2004). Best practice applies a standardised data definition throughout business branches. For example, a definition for an invoice overdue is anything over thirty days through all business branches (as opposed to fifteen days in a New York branch and thirty days in a London branch as it had been prior to best practice). Therefore, accountants spend less time reconciling data definitions, and allow the process layer of the ERP system to do the drudgery of financial data processing and consolidation. With ERP system and best practice, accountants had more time to focus on the analytical layer of the ERP system. Accountants could therefore integrate transactional accounting data with qualitative and quantitative insights available from other business functions through the integrated database in their ERP system and the Internet to forecast and control business performance.

The period of the 1990s can be labelled as the integration phase because there were many factors in the AIS arena that had to be incorporated together to enable the business controller role of accountants, and also because of the increasing tendency towards adopting fully integrated information systems. Technological advancements like ERP systems and the Internet, as well as consequences of the adoption ERP systems like best practice, were integrated with accounting innovations like ABC and BSC to make it possible.

AIS 2.0: 2000s – present

The term AIS 2.0 is inspired by the term *Web 2.0*, where user-generated content and compatibility with other IT systems are key to success. The decade from the 2000s onwards is labelled AIS 2.0 to highlight a significantly growing impact of accounting-generated business insights through ERP systems and *business intelligence* (BI). It also enabled AIS' ability to integrate with other innovations, like cloud computing, big data and blockchain to generate even more data-driven business insights.

ERP systems have become the key technology of choice in this era because of their ability to respond to ever-growing compliance requirements (Gupta & Misra, 2016). On top of that, the analytical layer and the e-business layers of ERP systems are now a prospering business. BI is now the common term referring to the analytical layer of business operations. BI is commonly connected to the ERP system, but it is not an absolute prerequisite, as some BI might be better positioned to gather data and information elsewhere (Elbashir et al., 2011). The most significant function of BI is to perform “data gathering, data storage and knowledge management with analysis to evaluate complex corporate and competitive information” (Negash & Gray, 2008, p. 176).

Similarly, the e-business layer integrated with the ERP system began to grow from the 2000s onwards as more and more businesses exchanged values over the Internet (Hsu, 2013) and via *cloud computing* (Marston et al., 2011). In a nutshell, cloud computing is a new technology enabled via the Internet for users to access an on-demand network of shared computing resources, e.g., networks, servers, storage, applications and services (Mell & Grance, 2011). The challenges that cloud computing creates from an AIS perspective are discussed in other sections of this volume. The trend now is that most business applications will be migrated to the cloud, including ERP systems (Raihana, 2012) and BI (Mircea, Ghilic-Micu, & Stoica, 2011). The e-business layer also holds the promise of enabling information produced through ERP systems and many other online databases to be shared among companies in a supply-chain in a timely yet cost-effective fashion. This gives rise to a relatively new technology called *Big Data*. Big data exploits a vast amount of data available on the Internet, other online databases and internally gathered historical data from ERP systems, along with the scalable information processing power of cloud computing, to answer any data-driven question when traditional methods to data analysis could not provide such an answer in a timely, cost-effective, and satisfactory fashion (Kraska, 2013). Other chapters in this volume provide a deeper discussion about the impact of big data on AIS.

Blockchain is another technology that has the potential to influence the future development of AIS significantly (Rosati & Čuk, 2019). The Institute of Chartered Accountants in England and Wales (ICAEW, 2018) believes that the adoption of blockchain technology will empower the accountancy profession to record more types of economic activities therefore increasing the capacity of AIS to provide a clear and reliable representation of them. In comparison to other existing AIS technologies, blockchain offers at least the following advantages: (1) decentralisation, (2) authentication, and (3) tamper-resistance (Dai & Vasarhelyi, 2017). In its purest version, a blockchain is essentially a distributed ledger where all nodes have access to the entire list of transactions. It relies on a public-key cryptography to authenticate the parties involved in the transaction and protect their privacy. It is tamper-resistant because once a transaction has been verified and stored in the distributed ledger it cannot be changed. As such, blockchain technology offers clear benefits for organisations, investors and regulators. Organisations and investors may benefit from the availability of real-time and reliable information about the organisation's economic activities therefore improving business and investment decision-making. Regulators may benefit from increased compliance to financial reporting standards and from higher data quality assurance (Rosati & Čuk, 2019).

The technological advancement in this period defines a new way of business operation such as how businesses are connected through the e-business layer of ERP systems. The power of the Internet, cloud computing, Big Data and blockchain represents a new landscape for business operations in many ways. For example, consumer trends are changing at a much faster rate than before due to the explosion of information sharing via social web, e-commerce sites and the Internet. Businesses must constantly refine and redefine their *competitive advantage* (Barney, 1991) to survive a constantly fluctuating market trend. In such a context, the analysis coming from AIS and accountants has risen to a strategic level. The business controller role of the 1990s has now escalated to the new role of *business partner* (Scapens and Jazayeri, 2003; Järvenpää, 2007). The role is similar to the *business controller* role, however, with a focus on data-driven analytics to shape effective and strategic decision-making, not just control decisions at the tactical level like it was before. The primary activities of accountants in organisations are to analyse information and advise management on how to navigate new and existing business ventures. They analyse information clues from multiple sources, both online and offline, to create a futuristic business vision (Järvenpää, 2007). The analysis role of the accountancy profession is even more pronounced given the rise of AIS technologies (Kokina et al. 2021). The term *business partner* reflects their main role in working alongside top management to shape strategic business decisions.

The AIS era from the 2000s onwards is referred to as AIS 2.0 because of the growing significance of analytics in shaping strategic business decisions. The AIS 2.0 era reflects a new way of how computerised AIS is used to support strategic decisions. New technological developments enabled through the Internet, like BI and e-business layers of ERP systems, cloud computing and big data, present a valuable opportunity to expand the role of AIS.

Conclusion

The accounting discipline has played a critical role in economic history. AIS have the merit of having supported accountants in activities since ancient times. Although mostly associated with information technology, rudimentary AIS existed long before the development of computers. As time passed, AIS evolved to include more features, which led to increased complexity. The evolution of AIS has been anything but linear. Indeed, it is possible to identify at least three significant breakthroughs that led to the AIS that we know today: (1) the introduction of double-entry bookkeeping, which gained particular importance in the industrial age (1700-1940); (2) the development of computers which opened the so-called Information Age in the 1950s; and (3) the adoption of the Internet which allowed the Integration Phase (1990s) to commence and enable the development of AIS 2.0 (2000s – present). Double-entry bookkeeping represents the essence of AIS. The increased level of transparency enabled the separation of ownership and control, a characteristic of the modern enterprise. Computers and the Internet represent the instruments that brought AIS to a superior level of sophistication. They have significantly enlarged the scope of AIS, which is not confined to the mere reporting or analysis of historical data, but also extends to the provision of forward-looking information to help top management in their decision-making. AIS are now able to convey timely and valuable information to both internal and external stakeholders, and are well recognised as a key component of companies' information systems. The effort to continuously adapt AIS to the constantly evolving business environment has brought AIS from a mere supportive role to that of a strategic one, and such a role is not likely to change in the near future.

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