18 Accounting information systems: supporting business strategy[1]

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Abstract

Arguments to invest in accounting information systems (AIS) are multiple, but two key themes have emerged in the literature: the potential for cost saving from improved efficiency and the capacity to support business strategies. This chapter examines the latter of these two themes, taking as its starting point Porter's two generic business strategies: cost leadership and differentiation. Two approaches to AIS acquisition are considered: bespoke development and off-the-shelf purchase. These two dimensions – generic business strategy and software acquisition mode – provide a framework for analysis of AIS support for firms, and the four quadrants of the framework provide the basis for this chapter. A key contribution of the chapter is the identification of the critical factors involved in the choice of AIS to support the business strategy. The chapter also considers the implications for AIS of new forms of business competition afforded by platforms, networks and ecosystems and new modes of transferring and recording value through cryptocurrencies and blockchains.

Introduction

Businesses in the 21st century are supported by accounting information systems (AIS). Among the most widely known AIS in business organisations are enterprise resource planning (ERP) systems and business intelligence (BI). Newcomers such as cloud computing technology for software, platform and infrastructure services over the Internet, cryptocurrencies and blockchains have recently become prevalent. These AIS have become more and more significant in the past two decades across departments and business organisations around the globe (Berry et al., 2009; Brukhanskyi & Spilnyk, 2019). Arguments to invest in AIS are multiple, but two key themes suggested in the literature are the potential for cost saving from improved operations and the capacity to support business strategies (Svejvig and Jensen, 2012).

This chapter examines the latter of these two themes: the use of AIS to support business strategy. The chapter takes as its starting point Porter's (1980) two generic business strategies: cost leadership and differentiation. The chapter also considers two approaches to AIS acquisition: bespoke development and off-the-shelf purchase. These two dimensions – generic business strategy and software acquisition mode – provide a framework for analysis of AIS support for firms with the four quadrants of the framework providing the basis for this chapter. The chapter ends with a discussion of new developments in strategy and the ability of AIS to continue supporting business strategies, given the recent advent of platform businesses, artificial intelligence, cryptocurrencies and blockchain technologies. This leads to an enhanced framework for AIS taking into account three key dimensions: the generic strategy adopted, the make or buy decision for software and the extent of sharing of the ledger using blockchain technology. A key contribution of the chapter is the identification of the critical factors involved in the choice of AIS to support the business strategy.

According to Porter (1980), business strategies fall under two main headings: cost leadership and differentiation. Cost leadership emphasises the cost element of the business profit formula; firms that follow such a strategy place continual emphasis on keeping their costs down. A differentiation strategy emphasises the revenue element of the profit; firms that follow such a strategy emphasise adding value by meeting customer needs more precisely, and charging a premium price for doing so. Given that each of these strategies can be followed across a broad or narrow range of the market, Porter (1980) suggests that cost leadership and differentiation strategies can be either broadly based or focused. Strategies, in turn, are implemented by carrying out activities in the firm's value chain (Porter, 1985). The activities to concentrate on must be carefully chosen: first, they must be effective; second, they must be carried out efficiently. Among the activities carried out by firms are providing firm infrastructure: this includes the provision of the information systems that underpin the firm.

Two decisions to take into consideration when thinking about investing in any AIS application are: what AIS will best support the firm's generic strategy? and what software acquisition mode should the firm employ? With respect to generic strategy, a decision to be a differentiator may require companies to create their own AIS, one that best fits their unique business requirements. On the other hand, a decision to be a cost leader will more likely take companies down the packaged software route, better known as an *off-the-shelf* solution, to save on software development costs

(Daneshgar et al., 2013). However, this may not always be the case: Walmart, an archetypal cost leader, gains significant competitive advantage from its proprietary and specific use of information technology (IT). With respect to the second question – software acquisition mode – the available options tend to cluster around building the AIS in-house or buying a solution. Two critical elements of this build or buy decision are the level of access to IT expertise and security of data and software.

Elements of AIS strategy

Costs

All costs associated with AIS, such as software development, licence fee, implementation and other ongoing costs, should be taken into consideration in a strategic decision. Traditionally, buying software incurs lower costs than developing software. However, hidden costs from off-the-shelf software, like implementation costs, ongoing support and maintenance fees, may be significant in the long run. Larger organisations may find it easier to gain access to financial resources required to develop their own AIS applications, but smaller organisations may find such commitment daunting (Daneshgar et al., 2013).

For a buy decision, the typical AIS acquisition process can be lengthy and expensive. Using an example of an ERP system, it is reported that a standard ERP implementation project lasts on average 15.7 months, with a mean project cost around $4.5 million and with more than 55% of projects exceeding their budgets (Kimberling, 2015). A recent report from Panorama Consulting, an ERP consulting firm, suggests that reasons behind an ERP project cost overrun include an unplanned expansion of project scope and an underestimation of project staff required, in addition to many other technical, organisational and data issues (Panorama, 2021). Regardless of a decision to build or buy AIS, cost overrun is a risk that should always be taken into consideration. Although every organisation is different and each has substantially different requirements in responding to their business strategies, an in-house-developed AIS solution will likely cost more than a purchased AIS solution (Daneshgar et al., 2013).

Business strategies

Companies with a unique set of requirements corresponding to their business strategies are likely to end up developing their own software. Bespoke AIS can support either cost leadership or differentiation strategies but in different ways. A large retailer such as Walmart may invest heavily in technology to allow it to gain efficiencies in distribution and logistics. Technology is a key factor in Walmart's implementation of its low-cost strategic approach and also in Dell's low-cost, direct-sales business model. On the other hand, differentiators may use IT to provide extra value to customers, as car manufacturer Lexus does with its service centres.

Firms, both cost leaders and differentiators, may buy their AIS from a vendor rather than build it from scratch. The important factor is that the AIS, whatever its origin, fits with and supports the business strategy. For example, an off-the-shelf ERP system may support a low-cost strategy by providing detailed cost and value information for products, resources, equipment and facilities. The same off-the-shelf ERP system may support a differentiation strategy by providing detailed, precise information that allows the firm tailor its offering to meet particular customer needs. Such suitable off-the-shelf ERP systems can support business strategy at potentially much lower cost than can bespoke systems which are typically more expensive.

Customisation provides a middle ground between a pure build or buy decision. It allows companies to combine advantages from using more cost-efficient, off-the-shelf solution and abilities to answer their strategic needs. However, issues can arise. Customisation is highly complicated, costly and likely to cause problems in the long run for software updates and maintenance. The customised software may not be compatible with the vendor's standard updates and maintenance releases in a future period (Quattrone & Hopper, 2006). Therefore, customisation should be kept at a minimum level, tending towards what is known as *plain vanilla* implementation (Finney & Corbett, 2007).

One factor that is likely to affect a decision to build, buy or customise is firm size. This is particularly so for multi-business firms or conglomerates: the more diverse the range of business units within the firm, the more strategies it may need to employ. Child (1972) suggests that as a firm increases in size, it obtains more opportunities for specialisation; however, this can render strategic coordination among diverse organisational units more challenging. Thus, larger firms often find standard, off-the-shelf software solutions unsuitable for supporting the business strategies for each and every business unit that they have. For larger organisations, which tend to have demanding business requirements, many types of AIS must be purposefully implemented together to support them. At an operational level, the ERP system is key as it provides a single database to consolidate operational data across organisations (Mabert et al., 2003). At a strategic level, decision support systems, e.g. BI, retrieve ERP transactional data to forecast and support strategic business decisions (Chen et al., 2012). The *big data* technology could harvest data outside the ERP system, e.g. census, labour and macro-economic data, which strengthen business decision making (Warren et al., 2015).

Generally speaking, smaller firms find it easier than larger firms to implement off-the-shelf AIS solutions as they have simpler business requirements (Markus & Tanis, 2000). An empirical study reports a significant difference between large and small firms with regard to ERP customisations (Mabert et al., 2003). Over 50% of large companies went through either significant or major customisations, but small firms only made minor customisations. The research suggests that large firms may find it impossible not to customise. After all, their complex operations and organisational structure create a pressure for more tailor-made processes and reports.

Access to IT expertise

To build and maintain software and data in-house requires a high level of IT expertise within firms. The overall key competency in the IT industry has shifted from *delivering a technology-based solution* to *managing a solution delivery process* (Bullen et al., 2009). In other words, the focus of the IT industry is no longer on software development but on implementing and customising existing software to fit business requirements. Therefore, firms might find it challenging to find competent IT professionals to deliver technology-based solutions in-house. Additionally, a complication of using in-house expertise is that firms must continually find new projects for these people to work on. Smaller organisations might not have sufficient project work in the long run.

An alternative to building in-house expertise is to outsource the development work to a third-party organisation. Outsourcing is a practice that has been greatly utilised in the IT industry since the 1990s (Lacity & Hirschheim, 2012). It promises European and US Chief Information Officers (CIOs) a saving of 10%–50% on their IT expenditures, along with a superior level of performance. Outsourcing can help companies eliminate the problems of recruiting, managing and maintaining an in-house IT competency. However, recent research suggests that outsourcing is not a silver bullet (Kobelsky & Robinson, 2010, Lacity & Hirschheim, 2012). Many organisations find themselves worse off from outsourcing agreements in comparison to their prior in-house IT departments. For example, Lacity & Hirschheim (2012) remark that it is tricky to think of outsourcing companies as a strategic partner. Outsourcing companies exist to earn profits in their own right, not to share their profits[2] with any other party. This is contradictory to the business partner concept, in which firms engage in mutual activity to gain reciprocal benefit.

Another solution to compensate for a lack of in-house IT expertise is to hire IT consultants (Chang et al., 2013). Hiring consultants is a common practice for many AIS implementation projects, especially ERP system projects. Consultants are perceived as carriers of knowledge, as they are involved in a similar job function with multiple organisations. Their main duties are to provide technical and business expertise to reduce the client's learning burden, give suggestions on AIS configurations and deliver user training (Chang et al., 2013). However, engaging with IT consultants represents another form of risk. The more firms rely on external expertise, the higher agency[3] risk they incur. Therefore, firms must be careful to select consultants that best fit their problem area; they must be aware of potential problems in a typical IT consultant engagement and put in place mechanisms to control IT consultants in order to minimise any agency risk (Wang et al., 2008).

Security

Security is one of the biggest concerns in AIS since they deal with confidential financial information and other key business information (CIMA, 2015). A decision to either build or buy has its own merits and issues when it comes to security. Purchasing an off-the-shelf system has the advantage that security for the system is developed and simultaneously tested by IT professionals. Earlier versions of off-the-shelf solution have also been tested in real life in many firms, locally or internationally. System bugs or security holes have very likely already been discovered and fixed. On the other hand, any security vulnerability in an off-the-shelf solution, if known to the wrong people, will introduce a serious risk to an organisation that has purchased that software. Most AIS today are connected with other systems through both internal and external networks, especially the Internet (Ellison & Woody, 2010). This interconnectedness has made it more difficult for firms to protect themselves against hackers.

The security merits and demerits for a self-developed system are the opposite from the off-the-shelf solution. Self-developed software is not likely to be subjected to the same level of stringent source code reviews, inspections and walkthroughs, as in off-the-shelf development. This is because a firm has more limited financial resources, expertise and time. This is in contrast to off-the-shelf solutions in which there are many firms pouring resources into source code reviews and software testing. However, although source code is largely proprietary to the organisation, there is still no guarantee that self-developed software will not be a target for hackers as most of these systems are connecting over the Internet.

Regardless of a build or buy decision, other dimensions of security are always of a significant priority to firms. Some of the key security issues are access control, access authentication, data encryption, firewalls, logs and audit trails and human factors (DPC, 2022). An access control protocol ensures that data is accessible only on a need-to-know basis. Those who have access to data must be able to authenticate their accesses through means such as a secure password and an access card with pin code to a computerised data centre. Data encryption is a technology to encode data and information stored on a device in such a way that only intended recipients can decode them. It is a key technology to ensure data is securely transmitted over networks. Firewalls are an essential tool that protects computers, or computer networks, against unauthorised access attempts from outside networks, especially from the Internet. In addition to that, they also prevent internal confidential information from leaving the internal network. Logs and audit trails are put in place to identify system use and to detect abuse. A system should be able to identify who the user is, time of access and any alterations to data files. The logs should be regularly reviewed for abnormal activity.

Human factors also play a key part in ensuring system security. The practice of exploiting humans to get sensitive information is known as *social engineering*. It is one of the biggest threats in cybersecurity (Salahdine & Kaabouch, 2019). No amount of state-of-the-art software security systems can prevent simple human ignorance of security issues. Staff should be informed about their responsibilities for security, for example, passwords should not be written down and suspicious email attachments should not be opened without a prior virus scan. Security policies and procedures must be put in place and requirement for compliance made clear to staff. Monitoring and control procedures must also be put in place. Cutting-edge technological advancements must be combined with proper staff training and communication.

An AIS strategy framework

The two key questions discussed in the previous section provide the fundamental dimensions for a matrix of AIS strategies that a company may employ (see Figure 18.1). The two-by-two matrix contains four quadrants, each one a key AIS strategy: Differentiator and Build, Differentiator and Buy, Cost leader and Build, and Cost leader and Buy. Each of these AIS strategies is now discussed in more detail.

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Differentiator and build

When firms decide to adopt this route, they should ensure that building their own AIS would allow them to build necessary competitive advantages they wish to attain. Paulsson (2013) reports a business case in which a global soft drinks company is employing a self-developed BI, on top of a packaged ERP system, to support the budgeting process within their global chain of organisations. The decision to invest in an in-house BI solution is directly linked with the company's strategy to be present in every corner of the world. As they produce soft drinks, of which water is the major component, it does not make sense from a cost point of view to distribute the product from a few production facilities around the world. To implement the strategy, the company must engage with a large number of local production facilities to produce and distribute the product, minimising distribution costs. To attract and retain local business partners, revenues are shared between the company and its local partners, depending on business strategies and circumstances in each country. As there is no standard formula to determine the revenue sharing structure between them, employing a standard off-the-shelf software solution was not possible. To accommodate this complicated system of revenue sharing, the company decided to build its own customised BI. In this case, the custom-built BI serves the company's strategy to make their product available around the world.

For strategy-sensitive business decisions, many business controllers and executives around the world rely on spreadsheets to make one-off business decisions (Panko & Port, 2012). This is because there is no predefined formula on how to make a decision on these one-of-a-kind business decisions. Business managers must rely on their understanding of the complex business problem at hand, gather relevant data and formulate a model to support their decisions. Spreadsheets, commonly used in such end-user computing solutions, are not an ideal type of AIS. They can contain errors in calculation formulae since they are rarely tested for bugs or reviewed by third parties. They might not cost money in real terms, as a company has already employed the very person who develops the spreadsheets, and the company does not have to hire anyone to do this work. However, there may be a significant opportunity cost because every minute that business managers spend on developing spreadsheets is lost time, time in which that they could have carried out their primary responsibilities in managing and running the business. Also, business managers typically are not trained in spreadsheet development, and therefore, they are likely to spend significantly more time than would an IT professional. Despite their advantages in supporting one-off business decisions, the literature suggests that end-user-developed spreadsheets should be kept at a minimum (Panko & Port, 2012).

In brief, in-house AIS,[4] such as BI and spreadsheets, have significant potential to support a differentiator business strategy, as firms are able to tailor these systems to support their business strategy. However, costs are noted as a key concern. Costs associated with a build decision are not just the firm's out-of-pocket expenses but also opportunity costs: the time and effort that business managers could have spent on performing their primary responsibilities rather than designing and developing AIS to support a unique business strategy.

Differentiator and buy

With this approach, firms enjoy the benefit of being able to pick and choose a packaged software system available on the market. Consultants may then customise and implement the software based on their competitive business advantages and business strategies (Rashid et al., 2002). However, a flaw with this approach is that most packaged AIS are developed following the software house's broad assumptions about business processes and industry's best practices. These are not always compatible with how a particular firm conducts its businesses. This results in a *misfit* between the functionalities that AIS can provide and the performance expected by firms (Soh et al., 2000). While misfits can occur at all levels of business organisations – operational, tactical and strategic – there is a particular concern when misfits occur at strategic level. This can lead to a situation where firms find that their AIS poorly supports their strategic business direction. For example, a firm wanting to pursue an online business strategy must have their AIS connected to the Internet; otherwise, it simply would not be able to support the online strategy. Given this logic, it is difficult to imagine an offline AIS that would effectively support a business like Amazon.com. Some examples of misfit at the strategic level addressed in the literature are a misfit with organisational philosophy and organisational structure, a misfit with business model and a misfit with business strategies.

Current research suggests that customisation is the most accepted method to tackle the problem of misfit at strategic level (van Beijsterveld & van Groenendaal, 2015). This is a process that allows firms to tailor *vanilla* AIS to fit their unique business strategies. It should be noted that customisation is not the only option to tackle misfit. Other available options such as workaround, acceptance of misfit, process adaptation and purchase of other software are suggested in the literature. Regardless of the option explored, there are trade-offs to make, e.g. customised software may not be compatible with future vendor update releases. A key debate when it comes to addressing a misfit is: should we change strategies to accommodate AIS? or should we change AIS to accommodate strategies? Generally speaking, firms should stick with their strategy and not alter it to suit AIS misfit. Strategy guides the firm, whereas AIS supports the strategy. Customisation may be a necessary evil for firms that choose the differentiator and buy route.

Sarker et al. (2012) point out that *technology adaptability*, i.e. the level of malleability of AIS to changing requirements and business strategies today and in the future, is a key factor that firms should look for when they compare packaged systems. This adaptability fits with current strategic thinking, which views strategy making as a craft – a blend of planned action and adaptive reaction to changes in the environment (Mintzberg & Waters, 1985). Technology adaptability through customisation at source code level was a main reason behind the success of Navision, a Danish ERP vendor acquired by Microsoft in 2002 (Antero & Bjørn-Andersen, 2013). European firms prefer customisation at the source code level – *deep customisation* – to customisation on top of the source code because this does not create unnecessary add-on modules. Such add-on modules risk altering business procedures and creating inconsistency across business functions.

An example may illustrate this more clearly. Assume that a national tax authority requires companies submitting a value-added tax return to include supplier names and their tax identification numbers. Each of a particular supplier's branches is assigned a different tax identification number under local law. In a general ERP system, supplier master data is not maintained at such a granular level, i.e. branch information is typically not included in the master data, only the headquarter data is maintained. In this case, a company is required to create an add-on module that will allow the company to manage supplier data at both headquarter and branch levels. This results in an inconsistency in the purchase cycle's core business procedure. That is, when the company issues a purchase order to a supplier, it is acceptable to refer to a supplier's headquarter master data since the company does not always know in advance which branch of the supplier will deliver the goods or service. However, when the company receives the goods or service from the supplier along with an invoice, which may come from a branch other than the supplier's headquarter, the company has to be careful to refer to the branch information and branch tax identification number from this point onwards. Otherwise, information shown on the value-added tax return would be incorrect.

This is an example of an inconsistency in business practice caused by add-on modules where it is not possible to do a deep customisation. There are many similar examples for European businesses, which are subject to European Union law alongside local laws and regulations. The case is more pronounced for multinational companies, which may use a single ERP system, but with local entities subject to local laws and regulations. Therefore, European firms might find it difficult to change their streamlined business practice to reflect new add-on modules. These are a consequence of restricted ERP system adaptability (van Beijsterveld & van Groenendaal, 2015). The case is even more pronounced given the new type of ERP system based on the cloud computing technology – *the cloud ERP system*. There are limited opportunities for cloud ERP customisation, especially in the public cloud space. Companies that are considering the cloud ERP solution, but look for a more flexible customisation condition, should investigate the private cloud solution (Gupta et al., 2017).

Cost leader and build

Traditional wisdom suggests that, all else being equal, a build decision costs more than a purchase decision (Daneshgar et al., 2013). Nevertheless, in some cases, firms pursuing a cost-leader strategy might find themselves better off by building their own AIS at a competitive price point to serve their cost-leader strategy. Recent innovations – especially from the cloud computing paradigm – make it possible for smaller companies to design, build and deploy their own AIS solutions based on their business requirements to support the cost-leader strategy. The National Institute of Standards and Technology in the USA defines cloud computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011). Integration-platform-as-a-service (iPaaS) and Cloud Service Brokerage (CSB) are two examples of innovative cloud-based solutions suitable for firms adopting a cost-leader strategy.

iPaaS is defined by Gartner Group as "a cloud service that provides a platform to support application, data and process integration projects, usually involving a combination of cloud-based applications and data sources, APIs and on-premises systems" (Guttridge et al., 2016). For example, RunMyProcess DigitalSuite is an iPaaS that allows firms to build, integrate and run workflow-based applications. The process design is simple and intuitive as it uses a drag-and-drop scheme to create a workflow. Firms have choices to integrate their application with other cloud-based applications, on-premises software, web services or even social network sites. Deployment is made easy with a built-in advanced testing mode. On top of that, a cloud-based platform like RunMyProcess allows business flexibility, i.e. firms have freedom to alter their AIS solutions to embrace a new business model and changing business environments. Costs for using such services can be competitive compared to traditional AIS solutions. CNIEL (Maison du Lait: The French Dairy Interbranch Organisation) is an example of an organisation that has adopted an iPaaS solution to manage its financial system. CNIEL is a non-profit association that promotes a smooth relationship between milk producers and processors, reinforcing a positive image of the French milk and dairy industry. It receives membership fees from dairy producers and processors and imposes a strict financial control on the association's expenditure budgets to ensure it gains maximum utility from these fees. Prior to the cloud computing revolution an Excel sheet was sent back and forth between departments, as each and every department had to input their invoiced amounts and reserve the budget for any quote received from vendors. This was inefficient, and controls were inadequate (see discussion above on use of spreadsheets as AIS). A new budgeting application was launched on the iPaaS to streamline the entire expense-related budgeting process (RunMyProcess, 2014).

For firms looking for additional professional services on top of the IT platform, CSB may be a better alternative for an AIS initiative using the cloud. According to the US National Institute of Standards and Technology, CSB is "an entity that manages the use, performance, and delivery of cloud services, and negotiates relationships between Cloud Providers and Cloud Consumer" (Sill et al., 2013). The scope of services and IT solutions that CSB provides is much wider than any iPaaS, i.e. CSB focuses on offering end-to-end solutions to a certain specific problem by aggregating IT solutions from multiple cloud vendors with optional consulting services to business clients. An iPaaS, in contrast, offers an IT integration platform to connect multiple cloud and/or non-cloud solutions together. Dell Boomi is an example of a CSB that extends its iPaaS offerings with professional services to help firms design, tailor, implement, run and manage their AIS solutions from start to finish. The professional service includes architectural design and validation, process development and best practice review, providing insight that firms cannot get from an iPaaS provider alone.

In short, innovative cloud-based solutions offer a vast array of opportunities for firms to tailor their AIS application based on their cost leadership strategy. Cloud-based solutions like iPaaS and CSB are nothing short of a revolution.

Firms having a high concern for capital investment and operating cost now have a cost-effective opportunity to tailor their AIS to support their cost leadership strategy (Bellamy, 2013).

Cost leader and buy

There are many options for cost-leader firms of all sizes to have access to a *plain vanilla* AIS. While traditional solutions like ERP systems and BI are the norm, it is up to firms and their IT staff/consultants to select a package that is most suitable for the firm's requirements and budget. However, one thing that firms must keep in mind is that such solutions typically require a large investment upfront, e.g. licence fee, consultants fee, annual maintenance and support fee, and hosting fee. These costs can prove to be high and may not suit a cost-leader strategy.

Cloud computing services may provide solutions for cost leaders looking to buy AIS, and cloud-based developments in this regard are occurring at a fast pace. Most traditional AIS vendors already provided offerings in the cloud. For example, SAP – the leading ERP vendor for most industries – launched SAP HANA, a cloud platform in May 2015. Tableau, a leading BI solution, is also available in the cloud.

Practitioner publications suggest that cloud-based AIS are suitable for firms in the following situations: (1) emerging businesses in a highly competitive sector, as a cloud-based solution allows them move faster and gives them an advantage in responding to changing business conditions; (2) smaller firms, especially small and medium-sized enterprises (SMEs), that have limited resources in terms of money and time, because cloud-based AIS solutions are more cost effective; and (3) firms which follow a cost-leader strategy, because pay-for-usage cloud-based solutions allow firms to keep up front investments to a minimum (Essex, 2015; Wallström, 2015).

Key advantages that the cloud solution offers over other traditional AIS – which reside and need to be maintained on the firm's own infrastructure – are cheaper implementation costs, faster implementation times, faster speed of system[5] and scalability (Armbrust et al., 2010). In the cloud model, cloud subscribers pay annual subscription fees to cloud service providers for hardware, software and IT infrastructure services. Cloud subscribers do not have to worry about ongoing system maintenance, which would generate a significant additional cost under the traditional approach.

One downside often reported about cloud solutions is weaker security, as cloud data is stored on servers that need to be Internet-accessible. However, cloud-based AIS need not necessarily have weaker security than on-premises AIS. Each solution has its own security merits and demerits. To store data on premise, physical access control to a data centre that houses the database server is needed, e.g. a surveillance system is required along with a data centre room specially designed to prevent unauthorised access to the data. The physical access control must be complemented with logical access control (e.g. passwords) and a regular audit procedure to ensure its effectiveness (Sandhu & Samarati, 1994). However, the professional fees corresponding to these activities can be hefty for smaller organisations, especially SMEs (Leimbach et al., 2013).

A decision to store data online through a cloud network eliminates the need for these security controls. However, it does bring a new set of problems – issues around data ownership, usage, integrity and confidentiality become more prominent compared to the on-premises model. Once physical control to the data is handed over to cloud-based data centre, data owners have little control on how these data might be accessed, transferred or used. Current technological advancements, like data encryption, are in place to ensure a certain level of data security, but they are not without limitation. For example, static data used by cloud-based applications, especially software-as-a-service and platform-as-a-service applications, is not encrypted due to technical difficulties in indexing and query writing. The presence of unencrypted data in multi-tenancy situation, for example, a cloud database in which data from multiple organisations are stored together, poses a serious threat to data security if there is no standard security policy and practice in place (Chen & Zhao, 2012).

Towards the future AIS – strategy and technology developments to observe

AIS as a field is developing at a rapid speed due to influences both from new business strategy, enabled through technologies, and from advances in technology. This section presents upcoming business strategy and technology developments to observe as these may play a significant role in shaping the future AIS.

Strategy: pipeline versus platform businesses

The AIS strategy framework discussed above was devised with traditional pipeline firms in mind, i.e. firms that follow the systems-based input-process-output mode. These firms take in components from suppliers, carry out manufacturing or service processes to transform these components into a finished product and then sell the finished product to their customers. The recent advent of the platform-based business is a new strategic form of carrying out business and is fundamentally different in nature to the traditional pipeline-based business (van Alstyne et al., 2016; Cennamo, 2021). Whereas pipelines are linear in nature with clear progression of elements down the value or supply chain from firm to firm, platforms are networks in nature and have several different kinds of customers linked together through a central platform (Eisenmann et al., 2006). Recent developments in digital and Internet technologies have allowed a range of platform-type businesses to evolve (Zhu & Iansiti, 2019). Platform businesses may charge one or more customer groups for their platform service: customer groups may be provided with the full platform service for free, others may obtain a restricted service for free and others a complete service for a fee. Many different charging mechanisms can be applied – for example, transaction charges, service fees or time-based subscription fees. Digital and Internet developments afford new strategic advantages gained from development of ecosystems and cooperation between competitor business firms (Jacobides, 2019; Brandenburger & Nalebuff, 2021), from network and data effects (Hagiu & Wright, 2020), from the ability to connect continuously with customers through wearable and non-wearable devices and through the Internet of Things (Siggelkow & Terwiesch, 2019). A separate but related technological development that also has implications for business strategy is the incorporation of robotics, algorithms and artificial intelligence into firm strategies (Kiron & Schrage, 2019; Iansiti & Lakhani, 2020; Lindebaum et al., 2020). Some authors imply that generic strategies such as differentiation do not apply, at least in the early stages, in these new types of market (McDonald & Eisenhardt, 2020). However, others advise that success in a platform business is not guaranteed and that strategic thinking and common sense still have relevance (Cusumano et al., 2020).

It is clear that AIS will need to evolve in conjunction with these Internet, digital and platform-based technology changes and with the new emphasis on ecosystems and cooperation among firms. AIS may need to manage the information flows between systems located in different parts of the world and between the different firms that comprise a network or ecosystem. AIS will have to manage information flow between the firm and a much greater variety of *things*, including people. This may require an AIS to manage information across the boundaries of firms, industries and states including all the intellectual property, security, privacy and data protection issues that will arise therefrom.

Technology: cryptocurrencies and blockchains

Two major technology developments over recent years may have implications for how AIS are built and maintained and for the manner in which AIS support business strategy. These are new technologies for storing and moving value (cryptocurrencies) and for recording and accounting for value (blockchains).

Cryptocurrencies were invented with an intention of becoming a means of self-regulated yet global medium of exchange, in lieu of traditional currencies which are regulated by a central government agency (Brukhanskyi & Spilnyk, 2019). Bitcoin is one of the most recognised examples of a cryptocurrency. Some major properties of cryptocurrencies are security, irreversibility, controlled supply and pseudonymity (Brukhanskyi & Spilnyk, 2019). Cryptocurrencies hold a power to become the financial instrument of choice for the future, especially crowdfunding. However, before we could get there, there is still much debate taking place on their legal status and use, especially in the accounting context. Firms should closely monitor developments in this area and adjust their business strategies accordingly.

Shared ledger technology based on blockchain principles has extended beyond its initial use in underpinning cryptocurrencies to supporting firms' business models and supply chains more broadly (Hughes et al., 2019; Morkunas et al., 2019). Blockchain holds much promise for AIS including *smart contract*, a key feature that is of special interest for AIS as it allows contractual terms of agreements to be executed automatically and without a trusted third party's involvement (Zheng et al., 2020). This feature may enable future AIS, built on the basis of blockchain, to rapidly verify transactions based on pre-specified business rules and accounting standards. Blockchain also has the potential to create an automatic system that keeps track of tokenised items, e.g. inventory and accounting documents (Dai & Vasarhelyi, 2017).

Although the application of blockchain to AIS is currently in its infancy, given the fundamental way in which it reorganises the recording of transactions and accounting for assets, it may become a key technology in AIS in the not-too-distant future. For this reason, we have extended the original matrix, shown in Figure 18.1, to include a third dimension based on an additional key strategic decision: to what extent will the firm move from its own proprietary ledger to a shared immutable ledger based on blockchain principles. Our decision to extend the original matrix is inspired by the platform business strategy and the blockchain technology. Such strategy-and-technology combination drives firms to simultaneously operate businesses in a tightly knitted manner, i.e. a drive towards a shared ledger based on blockchain principles. We posit that such change corresponds to the nature of AIS to manage information across boundaries.

<COMP: Place Figure 18.2 Here>

Figure 18.2 shows this enhanced matrix together with four additional resulting approaches to AIS-supporting business strategy. We will not elaborate on each of these four approaches separately but will provide some general points to consider in moving towards a shared ledger. The business strategy will likely still drive the approach to a shared ledger. Where the business strategy is cost leadership, the firm will likely seek out the cost reduction and efficiency advantages of a shared ledger. Where the business strategy is based on differentiation, the firm may seek out advantages from a shared ledger that support differentiation, e.g. improved security, reduced risk, improved trust, increased transaction speed and improved partnerships with other organisations. Regarding the second decision – build or buy – it is likely the choice of a shared ledger will also have an impact here. While the advantages and disadvantages of both build and buy discussed earlier in this chapter still apply, it is possible that a middle-ground approach will become available under blockchain. This middle-ground approach could be in the form of a shared or consensus-based development of AIS and ledger technology between the firm and its partners. We see the three decisions occurring in this order: first, the business strategy is chosen – low cost or differentiation; second, the level of ledger sharing is determined – proprietary or blockchain; third, the approach to software provision is decided – build or buy.

Conclusion

This chapter presents key ideas on how firms can use and, in particular, develop their AIS to support their business strategy. It is critical for organisational success that the AIS fit and support the generic business strategy, be it low cost or differentiation. The chapter outlined a two-by-two matrix representing a strategic AIS framework based upon two fundamental dimensions: the strategy type (cost leader versus differentiator) and the software acquisition mode (build versus buy). Four distinct AIS strategies are identified and discussed: Differentiator and Build, Differentiator and Buy, Cost leader and Build, and Cost leader and Buy (see Figure 18.1).

The chapter also points out that business strategy and technology developments are mutually affecting each other. Internet developments are converting business from being based along traditional pipeline value chains to being centred around platform-based ecosystems. Technology developments have created new ways to store and move value through a myriad of cryptocurrencies and new ways to account for value using blockchains. These changes will have implications for the ways and means by which AIS are developed and used in the future. The chapter therefore suggests that a third decision dimension may become relevant: the extent to which firms remain with their proprietary ledger or move to a shared ledger based on blockchain principles. The third dimension in incorporated into our enhanced framework (Figure 18.2).

Just as effective strategy making is a combination of good formulation and good implementation, so too effective AIS strategy is a combination of good selection and good execution. This chapter has examined the elements of selection in terms of acquisition cost and matching to firm strategy and the elements of execution in terms of buying an off-the-shelf software solution or building one's own bespoke system. As with all strategic decisions, consistency with the internal organisational situation and consonance with an ever-changing external environment are critical.

Figure 18.1 Matrix for AIS strategy.

Figure 18.2 Enhanced matrix for AIS strategy (includes additional dimension referring to extent of use of shared ledger technology).

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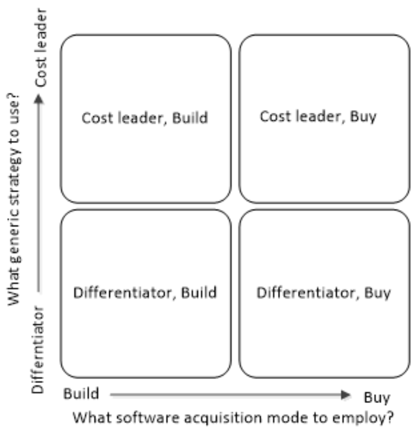

Figure 18.1: Matrix for AIS strategy

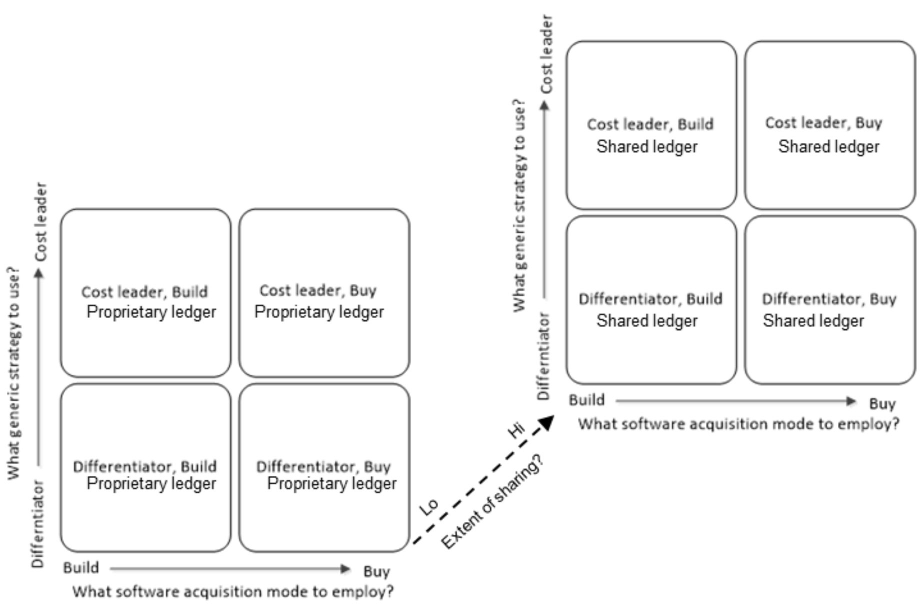

Fig. 18.2 Enhanced matrix *for AIS strategy (includes additional dimension referring to extent of use of shared ledger technology)*

[1] in Erik Strauss and Martin Quinn (Eds.) *The Routledge Handbook of Accounting Information Systems*, Second Edition, London: Routledge, 2022, pp.285-300.

[2] We acknowledge that this is a limited view towards the concept of business partner in outsourcing. However, our intention is to highlight a worst-case scenario when an outsourcing contract goes wrong. We believe that firms should be cautious, rather than overly optimistic, when they enter into any outsourcing agreement.

[3] This refers to the risk incurred when a principal employs an agent to carry out work on their behalf: there is a risk that the agent will not act in the best interests of the principal.

[4] The term *in-house AIS* excludes ERP systems because it is uncommon to find ERP systems developed in-house. In fact, a standard definition of ERP system already assumes that the system is available off-the-shelf only (Grabski et al., 2011).

[5] Faster speed of the system has a direct relationship with scalability. In the cloud computing model, firms are able to increase and/or decrease information processing capability on the cloud based on the volume of business transactions. The concept is known as *scalability*. An ability to process voluminous transactions with more processing capability results in a *faster speed of the system*.