
Article

The Strategic Role of Information Systems in Shaping Competitive Advantage: Internal and External Impacts on Business Environments

Xinyi Liu ^{1,*}

¹ Durham University, Stockton Road, Durham, DH1 3LE, United Kingdom

* Correspondence: Xinyi Liu, Durham University, Stockton Road, Durham, DH1 3LE, United Kingdom

Abstract: In the contemporary business environment, information systems (IS) have evolved from simple operational tools into strategic assets that shape how organizations compete, innovate, and adapt to market challenges. This paper investigates the multifaceted influence of IS on both organizational performance and industrial competition. Rather than merely improving efficiency, information systems now function as catalysts for strategic transformation and sources of sustainable competitive advantage. Within internal operations, the integration of IS supports data-driven management and facilitates the reconfiguration of traditional workflows. By digitizing core processes and enhancing communication across departments, organizations can achieve greater coherence, transparency, and adaptability. The transformation of DP World exemplifies this process—its adoption of intelligent digital infrastructure has optimized global trade logistics, reduced redundancy, and strengthened its position in international markets. Such developments demonstrate that the strategic use of technology extends far beyond automation; it redefines how value is created and delivered. Externally, IS reshape competitive interactions within industries by altering entry barriers, customer expectations, and cost structures. Porter's Five Forces framework offers a theoretical lens to understand this phenomenon. A prominent illustration is Ocado, an online grocery enterprise that integrates artificial intelligence, robotics, and machine learning to enhance fulfillment accuracy and operational agility. Through technological sophistication, Ocado not only achieves superior service quality but also constructs a resilient competitive shield that limits new market entrants. Although the financial and organizational costs of implementing advanced IS can be considerable, their long-term benefits are profound. Beyond cost savings, these systems contribute to strategic differentiation, continuous innovation, and the cultivation of dynamic capabilities. Ultimately, businesses that recognize and leverage the strategic potential of IS are more likely to maintain relevance and leadership in an era defined by digital transformation and rapid technological evolution.

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1. Introduction

In the modern global economy, the strategic deployment of information technology (IT) has become a key determinant of a firm's long-term viability and competitive performance [1]. An effective information systems (IS) strategy extends beyond simple data management, providing critical support for decision-making, streamlining operations, and enhancing a company's ability to compete in complex and rapidly changing markets. Historically, information systems were primarily designed to manage and maintain technical infrastructure, including hardware, software, databases, and networks [2]. These early systems played a foundational role in ensuring the continuity of business operations and supporting administrative tasks. Over time, however, the

function of IS has grown significantly, evolving from basic infrastructure management to a strategic instrument that enables dynamic decision-making and business innovation.

Fundamentally, information systems are structured mechanisms for collecting, storing, processing, and communicating information, integrating technological components with deliberate managerial application [3]. While the initial focus of IS was predominantly on technical resources, their contemporary role encompasses leveraging data for strategic insight, fostering innovation, and aligning technological capabilities with organizational objectives. In essence, IS are no longer just technological tools; they serve as platforms for extracting value from information, improving internal processes, and driving performance across all levels of an enterprise.

This essay aims to provide a comprehensive analysis of the strategic significance of information systems, examining their influence on both organizational operations and industry competition. By employing theoretical frameworks such as Porter's Five Forces and analyzing practical cases like DP World and Ocado, the discussion illustrates how IS contribute to building competitive advantage, enabling organizational transformation, and shaping broader market dynamics. Ultimately, the paper emphasizes that in today's information-driven business environment, the strategic utilization of IS is pivotal for achieving sustainable competitiveness and maintaining a leadership position amidst ongoing technological evolution.

2. Main Body

When making strategic decisions, companies need to consider both the external and internal environment, most companies use information systems and IT from within, however, these can also influence the external environment. This section will discuss the use and impact of internal information systems and analyse the impact of information systems on the external environment using Porter's Five Forces Model.

2.1. Internal Environment

This section will discuss the impact of information systems on change within organisations and use the case of DP World to demonstrate the impact. Information systems help organisations transform according to plan, saving human and material resources and increasing efficiency, and they also create value, highlighting competitive advantages and enabling companies to grow in the long term (see figure 1).

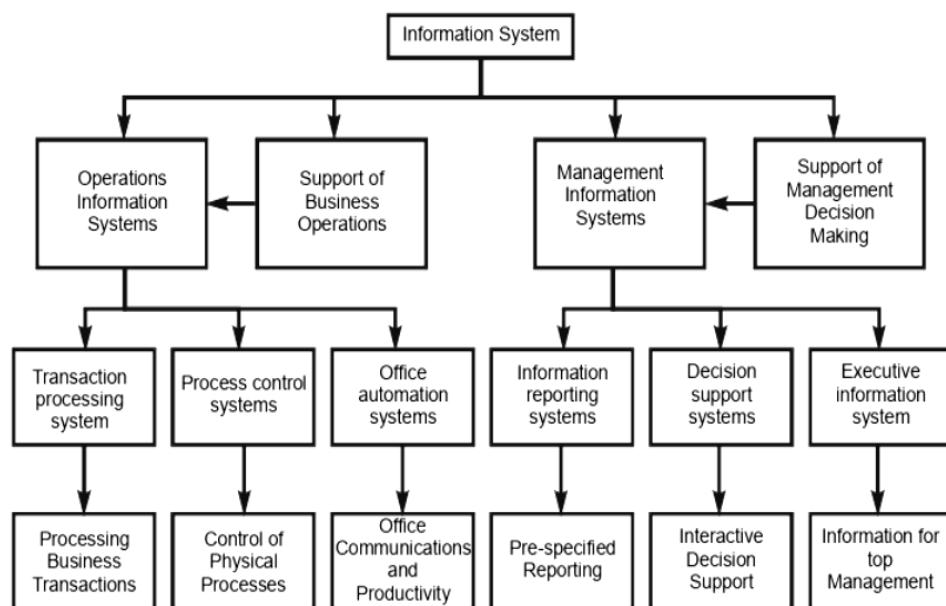


Figure 1. Information system.

As shown in Figure 2, a very large number of information systems can be used in an organisation, from the operational level to the managerial level. Another model of competitive advantage is the value chain model [4], which is the link between the activities carried out by a company and its competitive position. There are primary and secondary activities, with the primary activity being related to the creation or provision of a product or service, while the supporting activities complement the increased effectiveness or efficiency [5]. The implantation of information systems (see figure 3) has moreover helped companies to create integrated technology platforms, centralise systems, streamline processes, add internal value and also form interfaces between their value chain and suppliers and channels [4]. The question of how to introduce information systems and how they can help companies to change is a major concern for managers.

Support activities	Firm infrastructure	Planning models					
Human resource management		Automated personnel scheduling					
Technology development	Computer-aided design	Electronic market research					
Procurement	On-line procurement of parts						
	Automated warehouse	Flexible manufacturing	Automated order processing	Telemarketing	Remote servicing of equipment		
				Remote terminals for salespersons	Computer scheduling and routing of repair trucks		
	Inbound logistics	Operations	Outbound logistics	Marketing and sales	Service		
Primary activities							
							Margin

Figure 2. Levels of information systems in an organization.

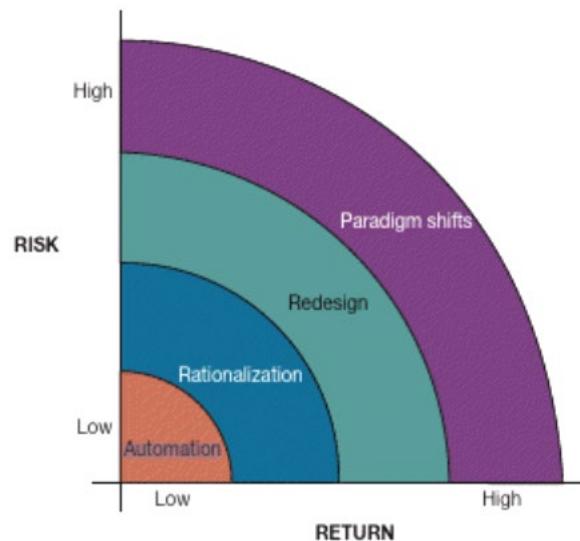


Figure 3. The implantation of information systems.

According to Laudon et al, the introduction of new information systems can help organisations to change as planned, and the risks and rewards associated with organisational change in information technology can be categorised into four types of change (see figure 4): automation, rationalization, redesign, and paradigm shifts [6]. The following will analyse the impact of each of these four forms on the organisation.

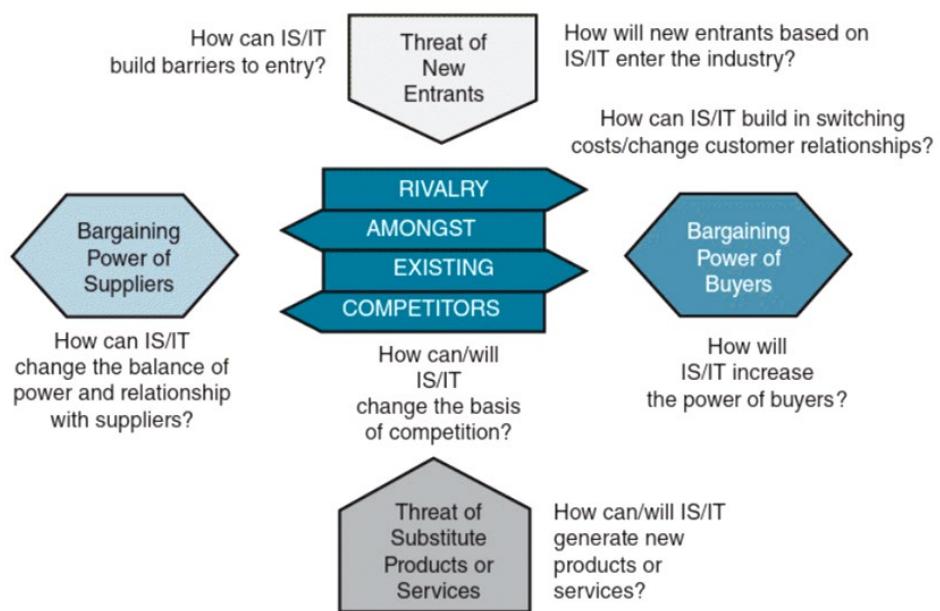


Figure 4. Types of organizational change in information technology.

The first, and most common form of organisational change, is automation, where information technology is initially put into the organisation to help employees do their jobs more effectively [6]. Common automation includes, for example, the calculation of payroll registers and the recording of attendance. Secondly, the deeper organisational change, which arose rapidly from the early automation, was the rationalisation of procedures. Despite the introduction of automation, some procedures and structures can become complex and cumbersome and painful, and procedural rationalisation is the rationalisation of existing procedures and the streamlining of standard operating procedures [6]. Whereas the first two components are limited to specific parts of the business, new information systems can affect even the design of the entire organisation, change the way business is done and even change the nature of the business, which is the last point of the paradigm shift. Rethinking the nature of the business and the nature of the organisation is at the heart of the paradigm shift, yet widespread organisational change is easy to fail because it is difficult to coordinate, yet the temptation for managers is staggering because of the spectacular, order-of-magnitude increases in return on investment or productivity that can be achieved if successful [6].

DP World is a world-leading port operator, operating mainly in maritime and inland terminal operations, with a target of 100 million containers by 2020 [6]. The initial adoption of technology was driven by a desire to improve the way cargo was handled, due to repetitive, time-consuming and error-prone manual and paper-based processes that caused delays and some unnecessary duplication, for instance, the client has to submit the same documents to several departments in order to pay the finance department [6]. The two main information systems introduced are WebSphere MQ technology of IBM, which simplifies and centralises the system to reduce red tape and greatly reduces the time taken to complete a process [6]. The other is Oracle Cloud Applications (SaaS) to drive digital transformation, enabling the standardisation of business processes and the creation of integrated technology platforms. Digital transformation includes intelligent IoT, artificial intelligence, supply chain intelligence and blockchain, which can, for example, intelligently and flexibly find the best solution for stowage and plan shipyard layouts to achieve lower costs, higher efficiency, more cost-effective and productive global supply chains. The introduction of these information

systems has helped DP World to stand out in the market as an enabler of digital global trade [6].

2.2. External Environment

Porter's five forces model refers to the five forces in the environment in which a firm operates that affect the firm and its competitiveness, including the bargaining power of buyers, the bargaining power of suppliers, the threat of new entrants, the threat of substitute products or services, and competition between existing competitors [4]. Information systems can change the competitive environment and thus influence competitiveness [4]. The following section will analyse how information systems can change the competitive environment and use Ocado technology as an example to further elaborate on this.

In terms of the bargaining power of suppliers, making purchasing decisions becomes quite easy due to the introduction of information systems, such as automated bills of materials and supplier proposal documents, where the sources of materials and prices are made open and transparent [4]. The use of information systems such as flexible computer-aided design and manufacturing systems, which make production faster and design or production less difficult, also affects the threat of substitution [4]. Barriers to entry have also been raised and potential entrants reduced as firms have spent large amounts of money on investing in complex software for information systems and technology [4]. Furthermore, this issue is related to switching costs and management should be encouraged to think about how to increase customers' dependence on their products and services, linking them to the business and making it difficult for customers to switch to other firms [7]. Competition from existing competitors is mainly about price differences, and prices for similar products can be very hurtful, so information technology can help firms to provide an effective competitive plan, for example by increasing the efficiency of their machines, or by adding features to their products or services to significantly increase productivity [7]. In the case of competing with existing competitors in the distribution industry, the use of automation in order processing and customer billing can increase one's competitiveness while reducing labour costs and increasing the fixed costs of new technology [4]. For the buyer, the use of information systems increases the transparency of product listings, making them easier for customers to understand and compare, making information public and increasing the power of the buyer [4].

Ocado is a UK-based online grocery platform whose goal and strategy are to change the industry and develop an easier and more efficient shopping experience. Ocado is now a company that can design its own facilities, write its software, and build its material handling solutions and robotics [8], the technical success can be replicated, but the barriers are too high for new entrants. To improve efficiency, the use of artificial intelligence and machine learning drove improvements in customer behaviour and stock prediction capabilities and built robotics that used over a thousand robots and a 3D grid system for split picking, handing goods from the warehouse to manual pickers and software algorithms to calculate truck routes, waste levels fell to a market leading 0.6% of sales, from customers ordering online to delivery, the process not only increases efficiency but also saves costs and increases competitiveness. The warehouse software is closely integrated with the front-end consumer website to provide customers with real-time availability and automatic reordering of the stock of suppliers, and to design all content on the platform to improve the accuracy of the website search engine and enhance the connection with the customer [8]. By providing good service to the customer and increasing the range of goods and improving the quality of goods, the cost of switching increases, attracting more customers while also increasing the return rate [9].

In short, the introduction of information systems, although somewhat costly, can also improve the competitive environment for businesses, increase competitiveness, raise barriers to entry, and so on [10]. However, technology can also disrupt the structure of the

industry, as when it helps customers to have easier access to information on flights as well as fares, allowing them to quickly shop for the lowest fares, which makes for less personal interaction with customers and makes the service more of a commodity [5]. Therefore, before introducing information systems, it is important to look carefully at the impact that new technologies can have on the structure of the industry, highlighting the advantages and preparing for the consequences.

3. Conclusion

Information systems have become a cornerstone of modern business strategy, as they not only support routine operations but also serve as critical enablers of innovation, competitiveness, and long-term organizational success. This essay demonstrates the strategic significance of information systems by analyzing their influence on both external and internal business environments. Externally, information systems empower organizations to collect and process vast amounts of market and competitor data, enabling timely and informed strategic decisions, improved customer responsiveness, and enhanced adaptability to rapidly evolving industry trends. Internally, these systems streamline operations, optimize resource allocation, and enhance decision-making efficiency, thereby fostering organizational agility, productivity, and sustainable growth.

Despite these insights, the discussion presented here remains somewhat limited. The diversity of information systems, ranging from enterprise resource planning (ERP) and customer relationship management (CRM) systems to emerging technologies such as artificial intelligence, machine learning, cloud computing, and big data analytics, has not been fully explored. Each of these technological advancements carries unique strategic implications, which merit deeper examination in future research. Moreover, empirical studies focusing on the measurable impact of different information systems across industries could provide actionable insights for managers seeking to leverage technology for competitive advantage. In conclusion, while this essay offers a conceptual overview of the strategic role of information systems, further exploration into specific system types, technological innovations, and their operational and strategic outcomes will be crucial for a comprehensive understanding of how information systems can shape business success in the increasingly complex global market.

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