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

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Abstract: This essay explores the strategic role of information systems (IS) in enhancing competitive advantage and influencing both internal and external business environments. Information systems have become essential tools for organizations, enabling better decision-making, efficiency improvements, and innovation. Internally, IS facilitate organizational change by automating processes, rationalizing procedures, and driving transformational shifts. This is illustrated through the case of DP World, where technology adoption has led to streamlined operations and a competitive edge in the global trade market. Externally, information systems also impact the competitive dynamics of industries, as shown through Porter's Five Forces Model and the case of Ocado, a leader in online grocery services. By integrating advanced technologies such as artificial intelligence, robotics, and machine learning, Ocado has not only improved operational efficiency but also created barriers to entry for new competitors. The essay concludes that while the introduction of information systems can be costly, it offers significant long-term benefits, including enhanced competitiveness and market positioning. The strategic deployment of IS is pivotal for businesses aiming to thrive in today's rapidly evolving technological landscape.

Keywords: information systems; competitive advantage; organizational change; porter's five forces; digital transformation

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1. Introduction

It is well known that strategic investment in information technology (IT) plays a crucial role in the long-term survival and growth of businesses in today's highly competitive global market (Arvidsson et al., 2014). In particular, an effective information systems (IS) strategy not only manages an organization's data and information but also supports decision-making processes, enhances operational efficiency, and drives the overall competitiveness of a company. Information systems have been integral to business operations long before the widespread adoption of modern IT, with early systems primarily focused on managing and maintaining hardware, software, databases, and networks (Merali et al., 2012). These foundational systems were essential for ensuring smooth organizational processes and supporting administrative functions. Over time, the scope of IS expanded beyond merely managing infrastructure to encompass more sophisticated roles in facilitating business strategy and supporting dynamic decision-making.

At their core, information systems are systems that organizations use to collect, store, process, and transmit information, combining both technical components and the strategic use of technology (Peppard et al., 2016). While IS initially centered on the technological hardware and software required to support business functions, their role has evolved into a more comprehensive tool for leveraging data, driving innovation, and ensuring the alignment of IT with business objectives. Rather than focusing solely on the technology itself, IS emphasize how information technology can be purposefully utilized to gain insights, improve processes, and create value across all areas of an organization.

This essay will contribute to a deeper understanding of the strategic importance of information systems by critically analyzing their impact on both the internal and external business environment. Through a focus on key models like Porter's Five Forces and real-world examples such as DP World and Ocado, this analysis will explore how information systems contribute to the development of competitive advantage, shape organizational change, and influence the broader competitive landscape. Ultimately, the essay will highlight the strategic role of IS in ensuring a company's success in a rapidly evolving business environment, where information has become one of the most valuable assets for achieving sustainable competitive advantage.

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).

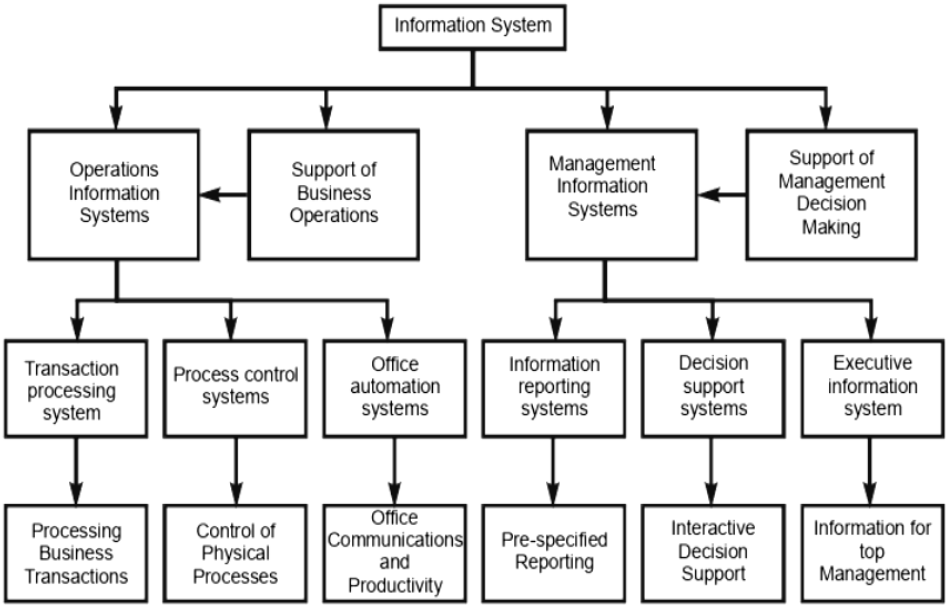

Figure 1. Information system.

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 (Porter et al., 1985: 150), 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 (Hemmatfa et al., 2010: 163). 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 (Porter et al., 1985: 150). The question of how to introduce information systems and how they can help companies to change is a major concern for managers.

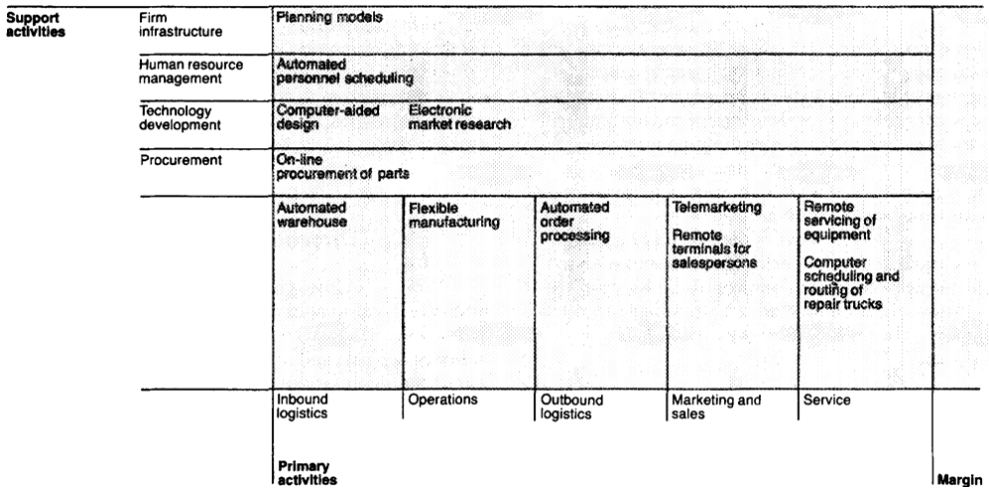

Figure 2. Levels of information systems in an organization.

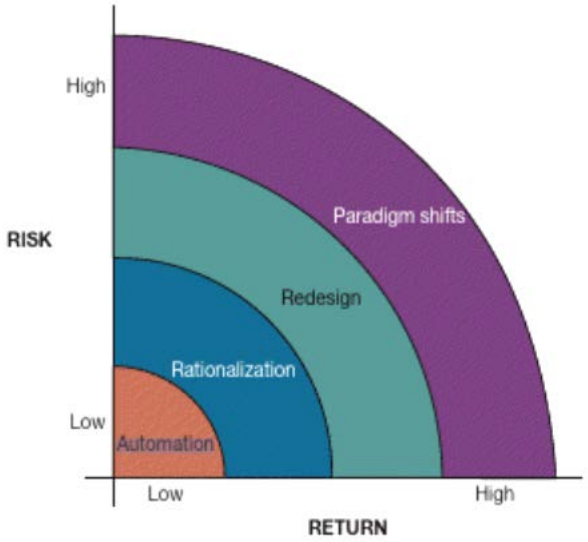

Figure 3. The implantation of information systems.

According to Laudon et al (2020: 527), 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. The following will analyse the impact of each of these four forms on the organisation.

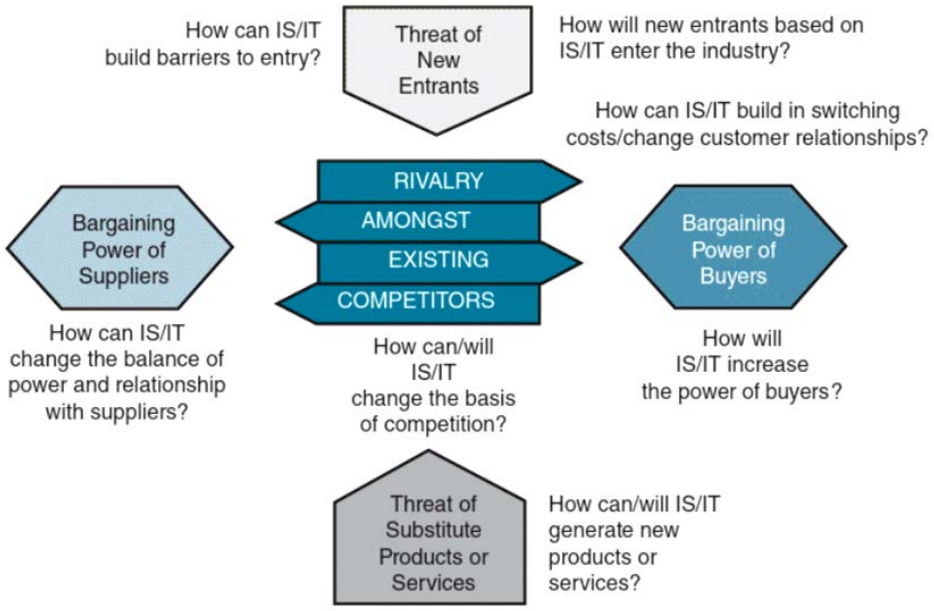

Figure 4. Types of organizational change in information technology.

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 (Laudon et al., 2020: 527). 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 (Laudon et al., 2020: 528). 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 (Laudon et al., 2020: 531).

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 (Laudon et al., 2020: 529). 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 (Laudon et al., 2020: 529). 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 (Laudon et al., 2020: 529). 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 (Laudon et al., 2020: 529).

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 (Porter, 1998). Information systems can change the competitive environment and thus influence competitiveness (Porter et al., 1985: 155). 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 (Porter et al., 1985: 155). 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 (Porter et al., 1985: 155). 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 (Porter et al., 1985: 155). 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 (Gamayanto, 2004: 129). 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 (Gamayanto, 2004: 129). 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 (Porter et al., 1985: 155). 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 (Porter et al., 1985: 155).

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 (Ocadogroup, 2022). Ocado is now a company that can design its own facilities, write its software, and build its material handling solutions and robotics (Smith, 2019), 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 (Ocadogroup, 2022). 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 (Smith, 2019). 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.

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. 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 (Hemmatfar et al., 2010: 156). 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

Overall, information systems are important due to their contribution of information systems to shaping competitive strategies, and information has become an enabler of new competitiveness in the global marketplace (Hemmatfar et al., 2010: 165). This essay highlights the strategic role of information systems in business nowadays by providing a cursory analysis of the impact have on the external and internal environment. However, this essay is limited in that the variety of information systems and information technology is not fully covered and is an open-ended research topic that could be explored in more depth in the future to explore the strategic implications of information systems.

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