

Determining Business Information System Strategies: A Ward and Peppard Approach

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Abstract

Digital transformation requires organizations to have information systems that are aligned with business strategies and able to respond to technological dynamics. This research aims to develop an information system strategy based on the Ward and Peppard approach by emphasizing system engineering aspects. The method used is a qualitative case study on an organization that is facing system integration challenges. Data were collected through semi-structured interviews, documentation, and observation. The analysis was conducted through the stages of business strategy analysis, IS/IT assessment, and strategic IS/IT planning, complemented by tools such as SWOT SI, Value Chain Analysis, and PESTEL. The results showed that the organization's information systems were still siloed and not functionally integrated, and did not support the organization's strategic vision. There was an urgent need for an adaptive, modular, and secure system, which was then translated into a cloud-based and modular SI architecture design. Internal validation showed that the strategy and system design developed were in line with the business and technical needs of the organization. This research confirms that the Ward and Peppard approach is not only relevant in strategic planning, but can also be implemented technically in the form of an applicable and sustainable system architecture design.

Keywords: information systems strategy, Ward and Peppard, systems engineering

Introduction

In the era of highly dynamic digital transformation, business information systems no longer act merely as administrative tools or support for managerial decision-making (Zhang et al., 2023). Today, information systems have become a core component of an organization's technology infrastructure, directly affecting operational agility, competitiveness and business sustainability (Setiawati et al., 2022). Modern information systems must be able to handle large volumes of data, ensure real-time availability of information, and support automation processes and integration across business functions (Vasileva et al., 2023). Therefore, the design and implementation of information systems cannot be separated from the principles of systems engineering and information technology architecture, which emphasize aspects of scalability, interoperability, security, and resource efficiency (Haße et al., 2022).

The need for an integrated system means that all components in the organization from production, finance, marketing, to customer service must be able to communicate through a uniform and interconnected technology platform (Gireesh Kambala, 2023). Scalability is important to ensure the system remains responsive when the volume of data or number of users increases, especially in the context of business expansion or spikes in market demand (Daniel Ajiga et al., 2024). On the other hand, adaptivity to technological change is also an absolute requirement. Information systems must be designed with a modular and flexible architecture in order to adapt to the emergence of new technologies such as cloud computing, Internet of Things (IoT), big data analytics, blockchain, and artificial intelligence (AI) without the need to completely reconstruct the system. As such, information systems now serve as the digital backbone that supports the structure and strategic direction of the organization (Ashrafi et al., 2025). Not only does it strengthen internal efficiency, but it also enables external collaboration, service innovation, and precision data-driven decision-making. Therefore, a strategic and

technical approach to designing information systems is crucial to address the needs of today while preparing the organization for the challenges of tomorrow.

Although information systems are designed to improve organizational efficiency, many projects fail due to a mismatch between IT strategy and technical architecture (Mohamed Hashim et al., 2022). This makes the system difficult to integrate, resource-intensive, and prone to operational disruptions. One of the main causes is the lack of a systematic approach in analyzing business and technical requirements in an integrated manner. Planning often only emphasizes the technological aspects without understanding the underlying business processes, making the system irrelevant or difficult to use (Kitsantas, 2022). Other technical challenges include the complexity of integration with legacy systems, infrastructure scalability, and demands for security and flexibility. These conditions demand an information system planning method that is able to link business strategies with technical needs as a whole.

Ward and Peppard's approach offers a strategic framework that combines business analysis and technical design in an integrated manner (Husaeni et al., 2024). This framework emphasizes the importance of system modeling, business process analysis, and alignment between organizational goals and information technology solutions. With a focus on the integration of business and IT strategies, this approach supports engineering-based decision making, which starts from business process mapping, identification of technical needs and capabilities (technical capability assessment), to the design of appropriate system solutions (Menezes & Salgado, 2024). Through this approach, organizations can ensure that the information systems developed are not only technically relevant, but also aligned with the long-term strategic direction.

In designing effective information systems, organizations need a method that can bridge strategic planning with concrete technical implementation. This is especially important in the context of developing technology-based solutions such as ERP, cloud architecture, data analytics, and cybersecurity layers (Visconti et al., 2024). Ward and Peppard's approach addresses this need by providing comprehensive analytical tools, such as Information Systems SWOT, Value Chain Analysis, and PESTEL, which enable a thorough evaluation of the fit between the business strategy and the designed system (Andry et al., 2023). The results of this analysis can then be translated into technical specifications, IT roadmaps, and system design recommendations that are aligned with the organization's operational needs and challenges.

Although the Ward and Peppard approach is widely used in strategic planning of information systems, there is still a lack of in-depth studies related to its application in the context of technical information systems engineering. Studies linking this framework with technical architecture design such as the use of UML, DFD, modular systems, and cloud-based deployment are still very limited. Most studies still focus on managerial or conceptual aspects, without showing how this approach can be translated into applicable technical designs. Therefore, there is a need for an information systems engineering-based case study model that shows the real application of Ward and Peppard in the context of thorough system analysis and design.

This research aims to analyze and develop an information system strategy using the Ward and Peppard approach focused on the systems engineering perspective. Through this approach, the research is directed to describe the relationship between business needs and technical solutions in an integrated manner, starting from the identification of the organization's core processes to the mapping of the required technological capabilities. Furthermore, this research also aims to design a system requirements map and provide information system architecture recommendations that are aligned with business strategies and able to answer actual technical challenges. With this approach, it is expected to produce an information system planning model that is not only conceptually strategic, but also measurable and technically implementable.

Method

This research uses a qualitative case study approach with a focus on designing a systems engineering-based information systems strategy using the Ward and Peppard framework. This method was chosen to enable in-depth exploration of the linkages between business strategy, user needs, and proposed technical solutions in a real organizational context. Data was collected through semi-structured interviews with key stakeholders, such as IT managers, systems analysts and end-user representatives, as well as through business process documentation and direct observation of relevant workflows. The analysis process was conducted through the three main stages in the Ward and Peppard approach, namely Business Strategy Analysis, IS/IT Assessment, and Strategic IS/IT Planning, with the help of analytical tools such as Information Systems SWOT, Value Chain Analysis, and PESTEL. The results of this analysis are then translated into a technical model of the information system using modeling tools such as UML (Use Case, Activity Diagram) and Data Flow Diagram (DFD), in order to produce a system requirements map and SI architecture design in accordance with the organization's strategy. Validation is done through discussions and feedback from internal parties of the organization to ensure compatibility between the formulated strategy and existing operational conditions.

Results and Discussion

Business Strategy Analysis

An analysis of the organization's business strategy showed that the company's vision and mission oriented towards service digitization and operational process efficiency had not been fully reflected in the information systems currently in use. Through interviews with management and internal documentation, it was found that a number of core processes such as customer data management, production monitoring, and financial reporting are still done manually or using separate applications that are not integrated with each other. This creates information delays, data duplication, and potential errors in decision-making. Based on the findings, the organization strategically emphasized the need for digital transformation as part of its medium-term growth agenda, especially in terms of improving operational efficiency and strengthening technology-based customer service. However, the existing information systems have not optimally supported these objectives. Table 1 below summarizes the gaps between the organization's strategic elements and its information system support.

Table 1. Gaps between Business Strategy Elements and Information System Support

Strategic Elements	Organizational Targets	Current Information System Condition
Digitization of core processes	Automation of production and service workflows	Processes are still manual or partially digital
Operational efficiency	Cost and process time reduction	Scattered data, lack of integration
Improved technology-based services	Fast, accurate, real-time data-based services	No unified system for customer data

The gap between strategic direction and current technical conditions indicates the need for an updated information systems strategy that is based on the latest business needs, and is able to accommodate the company's long-term vision. By integrating the Ward and Peppard approach, organizations can begin to align business objectives and IT systems through planning that is more structured and adaptive to future technological challenges.

IS/IT Environment Analysis (IS/IT Assessment)

Based on observations and interviews with the internal IT team, it was found that the information systems used by the organization were still siloed, each department using stand-alone applications without adequate integration. For example, the finance division uses local accounting software, while the marketing and customer service divisions rely on manual spreadsheets and separate communication platforms. This led to data fragmentation,

duplication of inputs, and made it difficult for management to obtain real-time cross-divisional information. In addition, the organization's IT infrastructure showed a mixed state, with some departments still using legacy systems that no longer received official technical support, while new systems were implemented on a limited basis without a clear integration roadmap.

This condition resulted in low operational efficiency and increased administrative workload, as the data synchronization process had to be done manually between units. Based on Ward and Peppard's analysis, this situation indicates that planning a new IT system architecture needs to prioritize infrastructure integration and modernization, especially through an ERP approach or a cloud-based solution capable of unifying cross-functional workflows. The adoption of integrated technologies will not only improve efficiency, but also provide a foundation for data-driven decision-making and future system scalability.

External and Internal Analysis

The internal and external factors of the information system were analyzed through the SWOT SI and PESTEL approaches, as recommended in the Ward and Peppard framework. The SI SWOT results show that one of the main weaknesses of the current system is the limited scalability of the system, which is unable to handle the increasing volume of data and users in the long term. In addition, the organization is still heavily dependent on legacy vendors, both in terms of software and technical support, limiting flexibility in developing the system independently. Meanwhile, from the PESTEL results, it was found that the development of digital technologies (such as cloud computing, AI, and data analytics) and national digital regulations (related to data protection and government digital transformation) are the two most dominant and urgent external factors.

The combined findings of both analyses emphasize that organizations need information system solutions that are more adaptive, modular, and secure against external changes. Adaptive in the sense that it is easy to adjust to changes in regulation or digital policy, modular so that it can be upgraded partially without dismantling the entire system, and secure because of the increasing cyber threats that are also part of the external context. This analysis provides a rational basis for designing a system architecture that not only addresses internal weaknesses, but is also ready to adapt to external dynamics.

Table 2. Summary of SI SWOT and PESTEL Analysis Results

Aspect	Key Findings	SI Strategy Implications
SWOT (W)	System is not scalable, depends on legacy vendors	Need to modularize and diversify technical platforms
PESTEL (T)	Technology is changing fast (cloud, AI, big data)	The system must be flexible and compatible with IT innovations
PESTEL (L)	Digital regulations and data protection are getting tougher	Need a secure, compliant, and standardized system

Value Chain Analysis

Analysis of the organization's value chain shows that there are several key processes that are crucial and have the potential to benefit significantly from information system intervention, particularly in terms of efficiency, accuracy, and speed of service. Based on observations of workflows and interviews with line managers, the processes most in need of integrated IT support are internal logistics, production processes, and customer service. In logistics, stock and distribution records are still done semi-manually, leading to data inconsistencies and delivery delays. In the production sector, there is no real-time monitoring system, so output tracking and machine efficiency are not optimized. Meanwhile, in customer service, there is no integrated system to monitor complaints, transaction history, and response time.

The results of this analysis confirm that strengthening information systems at key points in the value chain will have a direct impact on operational performance and customer satisfaction. Based on the Ward and Peppard framework, this identification process serves as the basis for setting priorities for system implementation, so that IT investments can be focused

on areas that provide the highest strategic value to the organization. An integrated system design for these key functions will also improve inter-unit coordination, speed up decision-making, and provide better data visibility across operational lines.

Requirements Map and System Architecture Design

Based on the results of business strategy analysis, IT environment evaluation, and identification of critical points in the value chain, this research produces a draft system requirements map and proposed information system architecture tailored to the conditions and strategic direction of the organization. The main needs identified include: an integrated inventory management system, a real-time production module, a Customer Relationship Management (CRM) system, and an analytical dashboard to support decision making. To accommodate these needs, a modular and cloud-ready system architecture was designed, allowing flexibility in future development and integration. Technical modeling is done using UML (Use Case Diagram and Activity Diagram) and Data Flow Diagram (DFD) to describe the flow of the system, the actors involved, and the relationship between modules. The system was designed with a layered architecture approach, consisting of a presentation layer (user interface), business logic layer, and data layer. In the context of infrastructure, the system is designed to be deployed in a hybrid cloud environment, taking into account aspects of data security, scalability, and interoperability. The following table summarizes the design requirements and architectural solutions.

Table 3. System Requirements Map and SI Architecture Recommendations

System Requirements	Proposed Architecture Solution
Real-time inventory management	Cloud-based inventory module with barcode integration
Production process monitoring	Production module with data capture sensor (IoT ready)
Customer service and complaint tracking	CRM integrated with customer database and online helpdesk
Data-driven decision making	Interactive visualization-based BI dashboard (e.g. Power BI)

This design is expected to be able to answer the gaps found in the previous stages of analysis, as well as provide an information system foundation that is not only strategic, but also measurable, flexible, and technically ready to be developed.

Strategy and System Design Validation

After the system requirements map and information system architecture design have been prepared, the next step is to conduct internal validation to assess the suitability of the system design and the actual needs of the organization. Validation is carried out through focus group discussions involving IT managers, representatives from operational divisions, and end users of the designed system. In general, respondents stated that the proposed system strategy and design reflected the actual conditions of the organization, both in terms of operational constraints and the desired direction of digital transformation. Input from the IT team emphasized that the prepared modular design would facilitate gradual integration without disrupting the existing system. Meanwhile, the operational team assessed that the proposed system could reduce administrative workload and improve data visibility across the value chain. Some minor adjustments were proposed, particularly regarding the user interface and the sequence of certain processes in the customer service module. The validation results reinforce that the Ward and Peppard approach used in the research effectively bridges strategic planning with technical requirements. Not only does it produce an information system strategy aligned with business objectives, but it also provides a realistic system design direction for implementation. As such, this approach model is deemed replicable in similar organizational contexts facing integration and digital transformation challenges.

Conclusion

This research shows that the Ward and Peppard approach is effective in developing a systems engineering-based information system strategy, especially in organizations facing the challenges of technology integration and digital transformation. Through business strategy

analysis, internal and external environment evaluation, and identification of critical points in the value chain, it was found that the existing information system was fragmented, not scalable, and did not support the organization's strategic vision. The proposed modular-based and cloud-ready information system design is capable of addressing the organization's key needs, ranging from inventory management to CRM-based customer service and analytical dashboards. The validation conducted showed that the developed design was not only technically suitable, but also had the support of internal stakeholders. Thus, this approach is not only relevant as a strategic planning framework, but can also be implemented technically in the form of a system architecture that is scalable, flexible, and adaptive to changes in the business and technology environment.

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