

Research Article

The key success factors of introducing ERP system: Application of AHP

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ABSTRACT

This study examines the key success factors of ERP introduction in Taiwan's manufacturing industry as a reference for enterprises to reduce the high and unforeseeable financial and time costs of ERP introduction. In the second phase, a questionnaire study was conducted using the Analytic Hierarchy Process to extract the relative weights of the distance between primary and secondary dimensions, and 5 primary dimensions were derived, including Management/Organization, Introduction Process, Technical Support, Documentation, and Personnel, as well as 15 secondary dimensions.

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1. Introduction

Taiwan has an island-based foreign trade economy, and its manufacturing industry is faced with energy deficiency, rising wages, and mounting environmental awareness, as well as competition from other countries, which all lead to operational difficulties; as an essential component in the transformation of enterprises, information management helps to increase productivity, improve product quality, and boost profitability.

The manufacturing sector is the mainstay of Taiwan's economy during the Covid-19 pandemic, with manufacturing output reaching NTD 3.5581 trillion in Q1 2021, which is an annual increase of 14.62%, the largest rise since Q2 2020, and positive growth for 2 consecutive quarters [12].

In recent years, business management systems have realized digitalization, and its application in information systems (IT) has drawn considerable attention in research works. One of these systems, the Enterprise Resource Planning (ERP) system, has become an

important instrument for senior managers to control and conclude transactions [5]. Therefore, the smooth and rapid introduction of ERP systems in the manufacturing industry has developed into a key subject for the Taiwanese manufacturing industry.

The term Enterprise Resource Planning (ERP) was first proposed by Gartner Group in the early 1990s. ERP is mainly a product extended by traditional material requirement planning (MRP) and manufacturing resource planning. In the past, on the issue of ERP import, the import process was often divided into stage tasks and design parts to achieve the purpose of system import. On the topic of introducing key success factors into ERP, the division basis of past research is mostly the system construction stage to discuss the key success factors of each construction stage. For example, in the early stage of system introduction, business executives must confirm that the establishment of the electronic system is consistent with the company's strategic goals, and they need to adopt a positive attitude towards this. Under the premise of increasingly mature and stable information

technology nowadays, system builders who have mastered the technical characteristics must be able to effectively apply the technical characteristics to the creation of competitive advantages, review the process rationalization, and provide good interface design at the same time. After the system is introduced, the actual users must have both the subjective will and the objective ability to use the system in order to fully implement the operation of the system. Throughout the above discussion on the key causes of ERP, we can find that the discussion is very rich and detailed. In this study, based on past scholars' discussions, the key causes of ERP introduction are divided into organizational and systemic aspects. The organizational aspect includes factors such as system introduction consistent with strategic goals, support from senior executives, good communication and planning, good project execution and management, and online user training. The system aspect includes factors such as clear definition of import category, effective use of technical features, good design interface design, and successful installation of software and hardware equipment.

This study combined the relevant literature on ERP introduction and established five primary dimensions and three items of ERP introduction for Taiwan's manufacturing industry with a total of 15 sub-dimensions. It is intended that the findings of this study will serve as an important reference for ERP introduction in Taiwan's manufacturing industry.

2. Literature Review

Enterprise Resource Planning (ERP) systems are often defined as a key managerial tool for planning the resources and transactions of an enterprise. The essential feature of this system is the storage, administration, and application of information to the plans and outcomes of business operations. Weill and Ross observed that the financial performance of enterprises with excellent Information Technology Governance (ITG) are superior to those with poor IGT [11], which suggests that informatization has a positive effect on the financial performance of firms, and literature review has confirmed that the introduction and operation of ERP have been a key factor in the success of enterprises [3]. According to statistics, nearly half (45%) of the existing ERP systems will be replaced by the new ERP systems available in the market today [9]. The findings of this

study can provide an important basis for the initial introduction, and serve as a reference when upgrading or updating systems.

During the introduction of an ERP system, there are a number of issues that enterprises may encounter. In addition to the support and active involvement of the enterprise's senior management [6], the selection of consultants and system vendors is also required to ensure that all operators have the relevant skills to safeguard the effective and continuous operation of the system. Enterprises should continue to educate their employees [1] and arrange training for key personnel to acquire the relevant knowledge [2]. Meanwhile, appropriate software should be selected to avoid unpredictable damage and allow room for future updates. Furthermore, managers should encourage all employees to participate in the introduction of the system, in order that all employees can contribute and be united in its application and use [10].

3. Key Model Building for ERP Introduction

This study adopted a quantitative approach, conducted a literature review of five journal papers on ERP introduction in enterprises, constructed 5 primary and 30 secondary dimensions, and took enterprises that had successfully introduced ERP systems as the subject [1,4,5,7,8]. A five-point Likert scale was developed as a prediction questionnaire to extract three out of the five primary dimensions, a total of 15 secondary dimensions were obtained, and then, the weights of each dimension were calculated using AHP to obtain the key success factors for the introduction of the ERP system in Taiwan's manufacturing industry.

4. Empirical Analysis

With the three highest scoring sub-dimensions and primary dimensions of the questionnaire as the actual measurement samples, 10 AHP questionnaires were returned from the middle and senior level managers in charge of ERP introduction in 10 enterprises. After consistency testing, the C.I. values are all ≤ 0.1 , thus, the 10 AHP questionnaires are all valid. Regarding each "primary dimension" and "secondary dimension", this study applied Microsoft Excel to calculate the relative weights. Based on the result, the connotation of each weight indicator is explained (as Table 1).

Table1. Results of the Overall Assessment of Key Success Factors for the Introduction of Enterprise Resource Planning (ERP) in Taiwan's Manufacturing Industry

Dimension	Weight	Rank	Evaluation Indicator	Weight	Rank	Weight	Rank
A Management/ Organization	0.1961	3	A1. Commitment of Business Owners and Executives	0.3635	2	0.0672	6
			A2. Awareness of Business Owners and Executives	0.1568	3	0.0288	10
			A3. Involvement of Business Members	0.4798	1	0.1011	3
B Introduction Process	0.2203	2	B1. Organization of Resources	0.1649	2	0.0412	8
			B2. Completeness of Documentation	0.1318	3	0.0251	12
			B3. Appointment of Professional Consultants	0.7033	1	0.1541	2
C Technical Support	0.1206	4	C1. Hardware Equipment Support	0.0908	3	0.0126	14
			C2. Software Equipment Support	0.2993	2	0.0292	9
			C3. System Administration Adequacy	0.6100	1	0.0789	4
D Documentation	0.0413	5	D1. Primary Document	0.1084	3	0.0042	15
			D2. Completeness of Data Structure	0.3464	2	0.0135	13
			D3. Maintenance and Completeness	0.5452	1	0.0236	11
E Personnel	0.4207	1	E2. Training	0.6804	1	0.2849	1
			E5. Project Lead	0.1699	2	0.0712	5
			E6. Clear Objectives	0.1496	3	0.0627	7

5. Conclusions and Propositions

The findings of the study "Key Success Factors for the Introduction of Enterprise Resource Planning (ERP) in Taiwan's Manufacturing Industry" are summarized below in order of weighting:

Proposition 1: In the "Key Success Factors for ERP Introduction in Manufacturing Industry", the "Personnel" dimension is more crucial than the "Introduction Process", "Management/Organization", "Technical Support", and "Documentation" dimensions, thus, it is recommended that business owners and executives should implement various staff education and training programs to develop capable and responsible employees.

Proposition 2: In the "Management/Organization" dimension, the "Involvement of Business Members" dimension is more crucial than the "Commitment of Business Owners and Executives" and "Awareness of Business Owners and Executives" dimensions, which demonstrates that the involvement of all members of the enterprise, and their perseverance, are key issues during the introduction process, as well as critical indicators for the success of the organization.

Proposition 3: In the "Introduction Process" dimension, the "Appointment of Professional Consultants" dimension is more crucial than the "Organization of Resources" and "Completeness of Documentation"

dimensions, thus, a competent professional consultant is an essential resource for planning, application, and system use experience.

Proposition 4: In the "Technical Support" dimension, the "System Administration Adequacy" dimension is more crucial than the "Software Equipment Support" and "Hardware Equipment Support" dimensions, as a stable and fit-for-purpose system can prevent unpredictable failures during the introduction process, and a secure and stable system can also bring competitive advantage.

Proposition 5: In the "Documentation" dimension, the "Maintenance and Completeness" dimension is more crucial than the "Completeness of Data Structure" and "Primary Document" dimensions, which indicates that the maintenance of documentation has a significantly positive impact on the system's introduction.

Proposition 6: In the "Personnel" dimension, the "Training" dimension is more crucial than the "Project Lead" and "Clear Objectives" dimensions, which corresponds to the statement that well-trained staffs are the most important asset of an enterprise, thus, routine education and conducting professional training designed for each project are also key factors in the introduction of the system.

Conflicts of Interest

The author declares no conflicts of interest.

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Authors Introduction

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