International Journal of Information Technology and Business Management
29th January 2017. Vol.56 No.1

ISSN 2304-0777 www.jitbm.com

KEY DETERMINANTS OF ORGANIZATIONAL PERFORMANCES INFORMATION TECHNOLOGY COMPANIES LISTED IN TAIWAN AS AN EXAMPLE

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Abstract

This paper intends to evaluate the weightings of the key determinants to organizational performances of information technology (IT) companies listed in Taiwan. Three IT companies, representative of the listed peers in Taiwan, are selected as the sample. The Analytic Network Process (ANP) was employed to analyze the relationship between criteria and identify the key factors and weightings of individual criterion. The results indicate that the weightings for R&D capability and innovative marketing were both over 0.2 and the weightings for intellectual capital accumulation and corporate governance were both above 0.1 according to the academia and industry professionals. In fact, both the academia and practitioners regard R&D capability, innovative marketing, intellectual capital accumulation, corporate governance and IT application as the key success factors to the IT companies listed in Taiwan. R&D capability is considered to be particularly important. The analytical results on the key determinants and priorities of organizational performances may serve as a template for management decisions by IT companies listed in Taiwan.

Keywords: organizational performances, Analytic Network Process (ANP), listed information technology companies

INTRODUCTION

Information technology (IT), a knowledge-intensive industry, has been a pillar of the Taiwanese economy. The revenue growth and international competitiveness of the listed IT companies in Taiwan over the past twenty years is particularly an achievement worthy of note. This paper posits that the management understanding of the key success factors is critical to

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the development of individual companies.

In the 21st century, customers seek instant gratifications and wish to quickly acquire customized products at a reasonable price. As a result, mass production became out of favour. Flexible and quick responses to customer needs and the offering of a large variety and quantity of bespoke products at the reasonable costs have become the goal of manufacturers[1]. Chen and Lee[2]indicated that the efforts by opt-electronics companies listed in Taiwan in mass customization have significant influence on operating performances.

Meanwhile, Yang[3]suggested that innovative marketing and product innovation have positive effects on organizational performances. Chen[4]re-examined the relationship between institutional ownership and operating performances by referring to productivity as an indicator of operating efficiency. The study indicates that productivity is a better measurement of firm performances compared to Tobin's Q. The study shows a significant and positive correlation between institutional ownership and operating performances. Based on this abovementioned, this paper believes that R&D capability can enhance the productivity and boost the organizational performances of IT companies. The degree of this effect is a topic worthy of exploration.

In the knowledge economy, intangible resources have replaced tangible ones as the key to firm competitiveness. Companies are constantly seeking to increase enterprise values by creating knowledge and building up intellectual capital. In a nutshell, the accumulation of intellectual capital has become a key differentiator to firm competitiveness[5]. Meanwhile, the IT industry is capita intensive. For the creation of competitive advantage in the constantly evolving knowledge economy, it is necessary to improve organizational performances with the accumulation of intellectual capital. In other words, the increase of intellectual capital improves enterprise values and enhances competitiveness advantage and core competences [6].

Corporate governance has become a topic issue and management trend on a global scale. A robust practice in corporate governance helps to expand international horizons, improve management quality and establish international competitiveness [7]. Chuang[8]contended that healthy corporate governance can mitigate agency conflicts and reduce agency costs. The establishment of the management and supervisory mechanism can maximize benefits to the company and improve the operating performance of the organization.
Cheng[9]suggested that corporate governance has positive and significant influence on firm performances. The level of this influence, however, is a subject that requires further examination.

Finally, the application of information technology also

ISSN 2304-0777 www.jitbm.com

affects organizational performances. Katz[10]believed that information technology helps companies to lower total costs, improve productivity, reduce accounts receivable, shorten response time to customers and enhance department performances. Chen[11]also indicated that the application of information technology creates a positive and significant impact on organizational performances. The degree of this impact is an issue worthy of academic attention.

Based on the above research motivations, this paper sampled the IT companies listed in Taiwan to examine the relationship between organizational performances and (1) flexible manufacturing capabilities; (2) innovative marketing; (3) R&D capabilities; (4) intellectual capital accumulation; (5) corporate governance; and (6) IT applications. A research framework is established to achieve the research purposes of this paper, i.e. the analysis and identification of the weightings of the key factors of organizational performances of the listed IT companies in Taiwan.

LITERATURE REVIEW

This paper referred to literature in Taiwan and overseas in order to summarize the key determinants of organizational performances. These sub-constructs are (1) flexible manufacturing capabilities; (2) innovative marketing; (3) R&D capabilities; (4) intellectual capital accumulation; (5) corporate governance; and (6) IT applications.

Relationship between Flexible Manufacturing Capabilities and Organizational Performances

Chen[12]posited that different flexible output patterns have different levels of contributions to profit margins and sales growth. For instance, output flexibility has positive and significant influence on profitability.

Yu[13]indicated that path flexibility helps to shorten production cycles and significantly improves quality performances in the semiconductor foundry process.

Wu, Sun and Lin[14]suggested that supply chain flexibility and information technology capabilities have positive influence over organizational performances.

Relationship between Innovative Marketing and Organizational Performances

Huang[15]indicated in his paper, "Knowledge Management, Innovation Strategies and Organization Performances - Integrated Circuit Manufacturing Industry in Taiwan as an Example" that marketing innovations have positive influence on organizational performances.

Wang and Lee[16]indicated that organizational innovations help to improve organizational and market performances. More importantly, organizational innovations enhance the benefits to organizational performances due to a greater sense of psychological security felt by employees.

According to Jhang-Jian[17], innovation climate, social

ISSN 2304-0777 www.jitbm.com

capital and knowledge sharing have significant and positive influence on innovation capabilities. They also have significant and positive influence over organizational performances because of the significant and positive influence of innovation capabilities on organizational performances.

Relationship of R&D Capability and Organizational Performances

According to the empirical study by Liang[18], the implementation of quality management and the improvement of R&D capabilities are significantly correlated with the operating performance of the LED (light emitting diode) industry.

Lin, Chou and Hsiao[19]believed that better technological efficiency can significantly improve return on assets, return on equity and price/earnings multiple.

Chen[4]re-examined the relationship between institutional ownership and operating performances by referring to productivity as an indicator of operating efficiency. The study suggests that productivity is a better measurement of firm performances than Tobin's Q. The research shows a significant and positive correlation between institutional ownership and operating performances. Based on this abovementioned, this paper believes that R&D capability can boost the productivity and hence the organizational performances of IT companies.

Wang and Liu[20]indicated that a high percentage of R&D human resources create positive influence on R&D performances. Meanwhile, R&D organizational management serves as a key moderating effect and interacts with R&D human resources in the influence over R&D performances.

Relationship between Intellectual Capital Accumulation and Organizational Performances

Peng[21]conducted a case study to examine the relationship between knowledge management drivers and knowledge management. The results suggest that organizations build up intellectual capital with the process of knowledge management. In fact, the accumulation of intellectual capital can boost organizational performances.

Tsen and Hu[22]said that intellectual capital can be divided into human capital, structural capital and social capital. Organizations are advised to develop human capital, which cannot be easily imitated by competitors. The cumulated intellectual capability can be transformed into core competences of the organization. The functioning of the structural capital creates the uniqueness of the organization. The establishment of external relationships that cannot be substituted can strengthen the social capital of the organization. The synergies of human capital, structural capital and social capital constitute the key to the establishment of organizational competitiveness.

Chen[5]indicated in his paper "The Study on the Relationships among Organizational Strategy,

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Intellectual Capital and Organizational Performance" that intellectual capital and organizational performances are positively and significantly correlated.

Chang[23]found that intellectual capital has significant and positive influence on organizational performances. In other words, the greater the intellectual capital, the better the organizational performances are. Meanwhile, intellectual capital serves, in part, mediating effects on the relationship between high-performance work systems and organizational performances. In other words, the adoption of a robust high-performance work system can improve organizational performances via the accumulation of intellectual capital.

Chen[24]commented in her paper, "The Relationship among Intellectual Capital, Business Strategy, and Financial Performance in Taiwan's Information Technology Industry" that intellectual capital has significant influence on financial performances.

Relationship between Corporate Governance and Organizational Performances

Cheng[25]contended that corporate governance can serve as a predicator to the organizational performances of small-and-medium enterprises.

Hung[26]indicated that institutional ownership and good corporate governance have significant and positive influence on the performances of both group-affiliated companies and non-group-affiliated companies. The study finds that foreign institutional ownership is the largest influencing factor.

Wang[27]suggested that ownership structure and board profile have significant influence on firm values. Robust corporate governance attracts investors because it ensures the return on their investments. In other words, corporate governance has significant and positive influence on performances[9].

Relationship between Information Technology Application and Organizational Performances

Katz[10]believed that information technology makes positive contributions to company competitiveness by reducing total costs, bettering productivity, improving account receivables, shortening transaction and response time and enhancing department performances.

Chen[11]thought that information technology applications have positive and significant influence over organizational performances.

Liu[28]indicated that the capability to apply information technology has significant and positive influence on organizational performances.

According to Lin, Tseng and Chu[29], the involvement of supply chain members in policy implementations, the application of information technology and the participation of manufacturing supervisors in decision making all have positive influence on organizational performances.

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RESEARCH METHODOLOGY AND DESIGN

Theoretic Foundation - Analytic Network Process

Analytic Network Process (ANP) is an extension of Analytic Hierarchy Process (AHP) by adding on a feedback system to obtain the internal relationships between criteria, goals and projects with ratio scales or even to achieve the optimal decisions[30]. Therefore, this study used ANP method to analyze the relationship between operating performances and individual constructs and criteria, in order to identify the priority ranking and weightings of key factors. The analytical results can serve as a template for management of the listed IT companies in Taiwan in the understanding of the relevance and weightings of key determinants of organizational performances.

An ANP network consists of decision criteria, clusters, elements (nodes) and links. If a node in a cluster and a node in another cluster have a dependence or feedback relationship, a link will be connecting these two clusters. The ANP methodology allows for interdependence or feedback relationships between elements in the same or across different decision criteria. If elements are interdependent or have a feedback relationship in the same decision criterion, this relationship is known as inner dependence. In the absence of inner dependence, the node in a criterion needs to be paired and compared with the node in another criterion. The interdependence or feedback relationship between elements of different criteria is called outer dependence ([31];[32]). The permission of interdependence or feedback relationship between criteria mimics the reality of complex issues in the society, particularly when the decision involves uncertainties and risks ([33];[34];[35]).

The ANP model is a suitable framework for solving the problems comprised of one or multiple networks in structure. The procedures for the construction of the ANP model are as follows:

(1) The identification of the elements and the clusters (i.e. classifications) required for problem solving;
(2) The establishment of the first cluster and the elements (nodes) in that cluster;
(3) The selection of the parent node and the examination of the children nodes under the influence of the parent node in the clusters; the pairwise comparison of the children nodes in terms of the impact from the parent node before the selection of another parent node;
(4) The connection of all the children nodes under the influence of the parent nodes, i.e. the pairwise comparison of nodes;
(5) The connection of the clusters completed with the links between all the relevant nodes; and
(6) The confirmation of the connecting lines indicative of the influence within the network and the pairwise comparison of the nodes and

ISSN 2304-0777 www.jitbm.com

clusters.

The calculation for the ANP network involves three matrixes, i.e. un-weighted super-matrix, weighted super-matrix and limit super-matrix. The un-weighted matrix is the original weightings derived with pairwise comparisons. The weighted matrix is the matrix with the weighting of the same element (as a component) taken from the un-weighted matrix and multiplied with the corresponding cluster weights. If the columns of the un-weighted matrix add up to 1 (i.e. stochastic), the unweighted matrix is also the weighted matrix. The limit super-matrix is the iteration of the powers of the weighted matrix until all the numbers in all the columns are equal. This allows the reference of the weight from any column for all the nodes. According to the calculation method developed by Satty[31]for the ANP model, if the super-matrix S is irreducible, lim SV=[w,..., w]. At this juncture, all the columns will have the same vector w and the convergence is achieved[35]. The ANP method can also be described in the following stages: (1) the application of the Delphi method or expert interviews to establish the hierarchical structure for evaluations; (2) the calculation of the weightings for elements of different hierarchical levels with the construction of pairwise comparison matrixes (i.e. questionnaire surveys), the estimates of eigenvalues and eigenvectors, consistency tests (<0.1) and the super-matrix and the limit super-matrix; and (3) the computation of the global weighting for all the levels[36].

Questionnaire Design

Based on the research framework, this paper developed the ANP model by referring to the constructs for organizational performances of the listed IT companies in Taiwan and the relationships between criteria. The analytical graph for the ANP model served as the template for the design of the questionnaire on the relationships between criteria concerning the organizational performance constructs of the listed IT companies in Taiwan. As the ANP method is suitable for the data collated via the interviews with a small group of experts, the author of this paper spoke with academic experts and industry executives to gain an understanding of the relative importance of individual constructs and criteria for the organizational performances of the listed IT companies in Taiwan.

Research Subjects

The questionnaire survey was conducted as follows:

(1) A total of 7 questionnaires issued to academic scholars and 6 were recovered, at an effective recovery rate of 85.71%;

(2) A total of 13 questionnaires released to industry professionals and 12 were recovered, at an effective recovery rate of 92.31%.

The high effective recovery rates were as result of convenience sampling.

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Research Framework

Table 1 summarizes the evaluation structure for the organizational performance of the listed IT companies in Taiwan; Table 2 outlines the constructs and definitions of the organizational performance of the listed IT companies in Taiwan; Table 3 illustrates the relationships between sub-constructs.

As shown in Table 3, the constructs are not completely independent of each other. In fact, some of them are correlated. In other words, the pairwise comparisons of nodes and clusters find that these nodes and these clusters are not entirely independent. This is why this paper uses the ANP model, instead of the ANP method[36].

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ISSN 2304-0777 www.jitbm.com

Table 1 Evaluation Structure for Organizational Performances of Listed IT companies in Taiwan

Goal	Constructs	Criteria
Organizational performances (OP)	Flexible manufacturing capabilities (F)	Volume flexibility (F1)
		Product mix flexibility (F2)
		Delivery time flexibility (F3)
		Market flexibility (F4)
	Innovative marketing (IM)	State-of-the art technology (IM1)
		Marketing activities often a reference case followed by peers in the industry (IM2)
		More creative marketing events than competitors' (IM3)
	R&D capability (R)	Rapid development of new products to meet the market needs (R1)
		Construction of robust databases to handle inquiries (R2)
		R&D spends per annum above the industry average (R3)
	Intellectual capital accumulation (IP)	Employees equipped with unique creativity (IP1)
		Knowledge and competences of employees sufficient to resolve work issues (IP2)
		Rapid development of new products to meet the market needs (IP3)
		Close relationships with supply chain partners from up to downstream (IP4)
	Corporate governance (C)	Good quality of earnings (C1)
		Healthy capital structure (C2)
		Good relationships with stakeholders (C3)
		Board qualities better than those of other companies (C4)
	Information technology applications (IT)	Employees equipped with strong capabilities to use computers (IT1)
		Extensive use of computers at workplace (IT2)
		Technology as the glue to the internal workflows (IT3)

Sources: This study & Lee[37]

ISSN 2304-0777 www.jitbm.com

Table 2: Constructs and Definitions of Organizational Performances of Listed IT and Electronics in Taiwan

Construct	Definition	Reference
Flexible manufacturing capabilities (F)	Lower manufacturing costs and shorter lead time to rapidly respond to changes and uncertainties in the business environment	Wang[1]
Innovative marketing (IM)	Product innovations and creative marketing techniques	Lee, Wang and Chang[38]
R&D capability (R)	R&D department's capabilities	Chen and Lee [2]
Intellectual capital accumulation (IP)	Competences, knowledge, information, experience, problem-solving capability and intelligence as part of human capital, structural capital and relation capital	Chen[11]; Chen and Lee [2]
Corporate governance (C)	Given the separation of ownership and management, the legal framework to effectively monitor company activities and enhance healthy operations so as to prevent fraudulences and corruptions. Corporate governance in the economic perspectives refers to the system designed to pursue the maximization of economic value of the company, i.e. the maximization of returns for shareholders, creditors and employees. If the focus is on financial management, corporate government gives capital providers peace of mind by ensuring managers to optimally utilize capital to generate due returns	Lu[39]
Information technology applications (IT)	Application of computers, software, data and storage technology	Laudon and Laudon[40]

Sources: This study & Lee[37]

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ISSN 2304-0777 www.jitbm.com

Table 3 Correlations between Sub-Constructs

Construct criteria / Construct criteria		F				IM			R			IP				C				IT		
		F1	F2	F3	F4	IM1	IM2	IM3	R1	R2	R3	IP1	IP2	IP3	IP4	C1	C2	C3	C4	IT1	IT2	IT3
F	F1	x	x	x	x	x	x	x	**v**	**v**	**v**	x	x	x	x	x	x	x	x	**v**	**v**	**v**
	F2	x	x	x	x	x	x	x	**v**	**v**	**v**	x	x	x	x	x	x	x	x	**v**	**v**	**v**
	F3	x	x	x	x	x	x	x	**v**	**v**	**v**	x	x	x	x	x	x	x	x	**v**	**v**	**v**
	F4	x	x	x	x	x	x	x	**v**	**v**	**v**	x	x	x	x	x	x	x	x	**v**	**v**	**v**
IM	IM1	x	x	x	x	x	x	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x
	IM2	x	x	x	x	x	x	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x
	IM3	x	x	x	x	x	x	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x
R	R1	**v**	**v**	**v**	**v**	x	x	x	x	x	x	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**
	R2	**v**	**v**	**v**	**v**	x	x	x	x	x	x	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**
	R3	**v**	**v**	**v**	**v**	x	x	x	x	x	x	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**
IP	IP1	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**
	IP2	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**
	IP3	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**
	IP4	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	**v**	**v**	**v**	**v**	**v**	**v**	**v**
C	C1	x	x	x	x	**v**	**v**	**v**	x	x	x	**v**	**v**	**v**	**v**	x	x	x	x	x	x	x
	C2	x	x	x	x	**v**	**v**	**v**	x	x	x	**v**	**v**	**v**	**v**	x	x	x	x	x	x	x
	C3	x	x	x	x	**v**	**v**	**v**	x	x	x	**v**	**v**	**v**	**v**	x	x	v	v	x	x	x
	C4	x	x	x	x	**v**	**v**	**v**	x	x	x	**v**	**v**	**v**	**v**	x	x	v	v	x	x	x
IT	IT1	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	x	x	x
	IT2	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	x	x	x
	IT3	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	**v**	x	x	x	x	x	x	x

Sources: This study

Note: (1) Columns for input systems

(2) Rows for the presentation in the WORD format

(3) F: Flexible manufacturing capabilities; IM: innovative marketing; R: R&D capability; IP: intellectual capital accumulation; C: corporate governance; IT: information technology applications

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ISSN 2304-0777 www.jitbm.com

ANP Analytical Procedures

This study refers to the workflows developed by Hu and Wang[36]to the ANP method as follows (Figure 1):

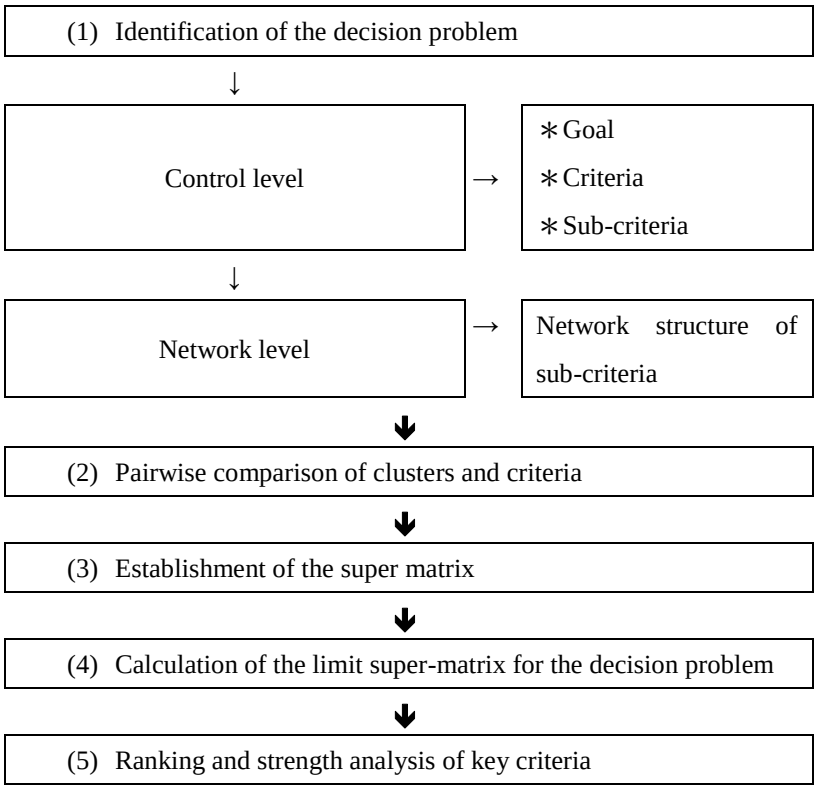

Figure 1: ANP Analytical Procedures

(1) Construction of the decision problem system

The ANP model defines the system into two layers. The first layer is the control level, comprised of goals, criteria and sub-criteria. All the decision criteria are considered mutually independent and only subject to the influence of goal elements. It is possible that there are no decision criteria for control factors. However, at least one goal is required. The weighting of each criterion in the control level can be derived with the traditional AHP method. The second layer is the network level, comprised of a network of inter-influencing clusters/components dominated by the control level.

(2) Pairwise comparison of clusters and criteria

After the construction of the decision problem system

ISSN 2304-0777 www.jitbm.com

and the feedback loop described in Step (1), pairwise comparisons of clusters, criteria and clusters/criteria with feedback relations are made in the same manner as in the AHP method.

(3) Establishment of the super-matrix

After the pairwise comparisons of clusters and criteria described in Step (2), the eigenvector for each criterion in the control level can be calculated with the AHP method. All the eigenvectors are expressed in a matrix, i.e. the super-matrix.

If the normalized column vectors in the super-matrix add up to 1, this matrix is stochastic. If not, the super-matrix is unweighted. The randomization of the unweighted super-matrix becomes the weighted super-matrix. The stochastic matrix has the largest possible eigenvalue of 1 and this makes matrix calculations easier.

(4) Calculation of the limit super-matrix for the decision problem

Step (3) describes the classification of the clusters in the super-matrix on the basis of the eigenvalues. This is followed with the multiplication of the weighted super-matrix into the limiting super-matrix. Different system structures result in different super-matrixes (decomposable, non-decomposable, basic, non-basic) and corresponding equations.

(5) Ranking and strength analysis of key criteria

The final step is to produce the rankings on the basis of weightings and to analyse the importance of key criteria for the organizational performance constructs of the IT companies listed in Taiwan.

RESEARCH FINDINGS AND CONCLUSIONS

Based on the research framework, this paper constructed the ANP model for the organizational performance constructs and the correlation between criteria for the IT companies listed in Taiwan. An analytical diagram served as a reference for the design of the questionnaire on the correlations between criteria for the organizational performances of the IT companies listed in Taiwan. Expert interviews were conducted to gain an understanding of the relative importance of individual criteria for the organizational performance constructs of the IT companies listed in Taiwan. The geometric means of the criteria were calculated according to question responses before the rankings of the criteria by using the ANP analytical software Super Decisions. The derived rankings were then used for the assessment of the organizational performance constructs of the IT companies listed in Taiwan.

Tables 4-5 list the CI values, weightings and rankings of the constructs and criteria for the organizational performances of the IT companies listed in Taiwan

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29th January 2017. Vol.56 No.1

ISSN 2304-0777 www.jitbm.com

according to the feedback from academia and the industry.

Table 4: CI Values, Weights and Rankings of the Constructs for Organizational Performances According to Feedback from Academia and Industry

Total construct	CI value		Sub-construct	CI value		Weighting		Ranking	
	Academia	Industry		Academia	Industry	Academia	Industry	Academia	Industry
Organizational performance	0.01	0.01	Flexible manufacturing capabilities (F)	0.00	0.00	0.093	0.057	5	6
			Innovative marketing (IM)	0.01	0.01	0.224	0.223	2	2
			R&D capability (R)	0.01	0.02	0.233	0.235	1	1
			Intellectual capital accumulation (IP)	0.00	0.01	0.193	0.191	3	3
			Corporate governance (C)	0.00	0.00	0.182	0.183	4	4
			Information technology applications (IT)	0.00	0.00	0.084	0.083	6	5

Sources: This study

As shown in Table 4, the CI values based on the feedback from academic scholars and industry professionals are all smaller than the 0.1 threshold proposed by Saaty ([36]；[37])

Table 5: Weights and Rankings of the Criteria for Organizational Performances According to Feedback from Academia and Industry

Sub-construct	Criterion	Weighting		Ranking	
		Academia	Industry	Academia	Industry
Flexible manufacturing	Product mix flexibility (F1)	.204	.223	4	3
	Volume flexibility (F2)	.223	.214	3	4

International Journal of Information Technology and Business Management
29th January 2017. Vol.56 No.1

ISSN 2304-0777 www.jitbm.com

capabilities (F)	Delivery time flexibility (F3)	.313	.315	1	1
	Market flexibility (F4)	.265	.254	2	2
Innovative marketing (IM)	State-of-the-art technology (IM1)	.256	.363	3	2
	Marketing activities often a reference case followed by peers in the industry (IM2)	.351	.248	2	3
	More creative marketing events than competitors' (IM3)	.393	.391	1	1
R&D capability (R)	Rapid development of new products to meet the market needs (R1)	.562	.555	1	1
	Construction of robust databases to handle inquiries (R2)	.313	.313	2	2
	R&D spends per annum above the industry average (R3)	.129	.137	3	3
Intellectual capital accumulation (IP)	Employees equipped with unique creativity (IP1)	.282	.287	2	2
	Knowledge and competences of employees sufficient to resolve work issues (IP2)	.353	.353	1	1
	Rapid development of new products to meet the market needs (IP3)	.216	.202	3	3
	Close relationships with supply chain partners from up to downstream (IP4)	.154	.165	4	4
Corporate governance (C)	Good quality of earnings (C1)	.262	.214	2	3
	Healthy capital structure (C2)	.335	.332	1	1
	Good relationships with stakeholders (C3)	.222	.254	3	2
	Board qualities better than those of other companies (C4)	.185	.205	4	4
Information technology applications (IT)	Employees equipped with strong capabilities to use computers (IT1)	.282	.323	2	2
	Extensive use of computers at workplace (IT2)	.146	.109	3	3
	Technology as the glue to the internal workflows (IT3)	.575	.573	1	1

Sources: This study & Lee[37]

RESEARCH CONCLUSIONS & SUGGESTIONS

Research Conclusions

Sub-constructs

As shown in Table 4 and according to the feedback from academic scholars, the most important sub-constructs are R&D capability (0.233), innovative marketing (0.224), intellectual capital accumulation (0.193), corporate governance (0.182), flexible manufacturing capabilities (0.093), and information technology applications (0.084). Industry professionals rank the sub-constructs slightly differently: R&D capability (0.235), innovative marketing (0.223), intellectual capital accumulation (0.191), corporate

ISSN 2304-0777 www.jitbm.com

governance (0.183), information technology applications (0.083) and flexible manufacturing capabilities (0.057).

The opposite ranking of flexible manufacturing capabilities and information technology applications by academia and the industry is as a result of the academic focus on theory and rationale vs. the practical approach and emphasis by industry executives.

Meanwhile, the weightings for R&D capability and innovative marketing as rated by both academia and the industry for the IT companies listed in Taiwan are over 0.2. The weightings given by both academia and the industry for intellectual capital accumulation and corporate governance are both above 0.1. In other words, R&D capability, innovative marketing, intellectual capital accumulation and corporate governance are considered by both scholars and industry professionals to be highly important. R&D capability is regarded as the most critical factor.

Criteria

An analysis on the criteria under sub-constructs based on Table 5 is as follows:

(1) Flexible manufacturing capabilities

Both academia and the industry believe that delivery time flexibility is the most important criterion of the sub-construct of flexible manufacturing capabilities (0.313 by scholars; 0.315 by industry professionals). This is followed by market flexibility (0.265 by scholars; 0.254 by industry professionals). The views from scholars and industry professionals about product mix flexibility and volume flexibility are exactly the opposite.

(2) Innovative marketing

Both academia and the industry believe that marketing activities more creative than competitors' is the most important criterion of the sub-construct of innovative marketing (0.393 by scholars; 0.391 by industry professionals). The state-of-the-art technology and marketing activities often as a reference followed by peers in the industry are ranked differently by academic scholars and industry professionals. This may be a result of the theoretic approach taken by scholars vs. the practical perspectives of the industry.

(3) R&D capability

Both academia and the industry share the same view about the importance of the criteria under the sub-construct of R&D capability. It is agreed that the rapid development of new products to meet the market demand is the most important criterion (0.562 by scholars; 0.555 by industry professionals). This is followed by the construction of robust databases to handle inquiries (0.313 by scholars; 0.313 by industry professionals) and then R&D spends per annum above the industry average (0.129

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by scholars; 0.137 by industry professionals).

(4) Intellectual capital accumulation

The views from academia and the industry are consistent regarding the rankings of criteria under the sub-construct of intellectual capital accumulation. Knowledge and competences of employees sufficient to resolve work issues is considered to be the most important criterion (0.353 by scholars; 0.353 by industry professionals). This is followed by employees equipped with unique creativity (0.282 by scholars and 0.287 by industry professionals) and finally Close relationships with supply chain partners from up to downstream (0.154 by scholars and 0.165 by industry professionals).

(5) Corporate governance

Both academia and the industry believe that a healthy capital structure is the most important criterion of the sub-construct of corporate governance (0.335 by scholars and 0.332 by industry professionals) and the board qualities better than those of other companies is the least important (0.185 by scholars and 0.205 by industry professionals).

(6) Information technology applications

Both academia and the industry express the same opinions about the importance ranking of criteria under the sub-construct of information technology applications. It is consensus that technology as the glue to the internal workflows is the most important criterion (0.575 by scholars; 0.573 by industry professionals). This is followed by employees equipped with strong capabilities to use computers (0.282 by scholars; 0.323 by industry professionals) and finally extensive use of computers at workplace (0.146 by scholars; 0.109 by industry professionals).

Research Contributions

This paper employs the ANP method to assess the key determinants of the organizational performances of the IT companies listed in Taiwan. This is an innovative application of theories in information management. The research findings can serve as a reference to the management of the IT companies.

Research Limitations and Suggestions

(1) The expert interviews were conducted, as part of the ANP method, to collate data. However, this paper adopted convenience sampling so the data could be considered subjective. This is the biggest limitation in research.

(2) This paper referred to literature in Taiwan and overseas in order to summarize the key determinants that influence organizational performances. Follow-up studies are suggested to conduct a principal component analysis (as a factor analysis technique) to extract the key factors of

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organizational performances. The weightings can be based on the feedback from academia and the industry.

The literature review finds many scholars use the ANP method to identify the weightings for the non-dependent sub-constructs or to select from a list of proposals. The typical approach to the ANP method is to use Super Decisions (a software program) to process the data collated via the interviews with a small number of experts. Follow-up studies can also use the ANP method to evaluate management proposals.

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