African Journal of Business Management

Volume 8 Number 8 28 April, 2014

ISSN 1993-8233

Academic Journals

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DOI: 10.5897/AJBM11.2505
ISSN 1993-8233

http://www.academicjournals.org/AJBM

African Journal of Business Management

Review

The expatriate professor: Lessons from teaching management in Africa

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Received 11th October 2011; Accepted 6th March 2012; Published 28 April 2014

Drawing on the experience gained by an American teaching undergraduate, graduate, and post-graduate student in three different African settings, this paper shares some key lessons learned and makes recommendations for other non-Africans who or will be teaching management in Africa. Pedagogically, it is important to utilize business cases that are relevant to the African context. Communicatively, it is recommended that the professor recognize some of the subtle variations between English as spoken in North America, Europe and Africa. Personally, professors are encouraged to delicately leverage their local context to enhance the learning experience.

Key words: Management pedagogy, African business education.

INTRODUCTION

In his discussion of the 2002 United Nations World Summit on Sustainable Development, America (2003) makes the following provocative statement:

"*The delegates discussed the policies of the International Monetary Fund and the World Bank, the legacy of colonialism, slavery in Sudan, and land redistribution in Zimbabwe. In all their discussions, however, very little attention was paid to the issue that may be the most important to the development of African nations – modern advanced management education".*

It is widely recognized that improving the quality and availability of management and business education will have immeasurable impact on strengthening Africa's economies. However, more than 30 years after Safavi (1981) published a model to improve management education in Africa, there are still challenges across the continent. Yet, Bisoux (2008) argues, "Unfortunately, most African business schools are not yet up to the challenge of providing that much needed training…they are hindered by political instability and lack of public funding." Symonds (2012) asks, "…what is the business education community doing to help Africa to fulfill its true potential?" Pfefferman (2005) calls for increased donor support for African business schools.

However, there are some bright spots on the African continent and increased reason for optimism. America (2003) notes, "With the right partners and support structures, some scholars say, many of Africa's 60 full- and

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part-time Master of Business Administration and executive Master of Business Administration programs can improve their teaching, research, community service and consulting." Damast (2012) spotlighted partnerships between American, German and Chinese business schools and their African counterparts. This short communication is designed to assist some of those would-be partners, particularly professors from non-African business schools who either through partnerships or faculty exchange programs will temporarily become "expatriate professors" teaching management courses in Africa. In this paper some of the lessons learned from my experiences teaching management across the African continent will be shared. First, the various educational settings will be described.Then, some tools and techniques found to be effective were articulated.

BACKGROUND

Three teaching experiences provided the context for this paper. The first experience and the author's first exposure to African business education came at the Ghana Institute of Management and Public Administration (GIMPA). At Ghana, classes were taught both in the Executive Masters in Business Administration (EMBA) and the Masters in Business Administration (MBA) programs. In each case, the course was administered during a 3-week summer intensive. After teaching in Ghana, the author was invited to participate in a continuing education program for graduates of the Lagos Business School.

This alumni gathering included a cross sample of Nigeria's public and private sector elites. Lastly and most recently, the author served as a guest lecturer for the Faculty of Management and Administration at Africa University established in 1992 by the United Methodist Church. Africa University is a private, international institution located near Mutare, Zimbabwe.

Accordingly, the teaching experiences that motivate this paper resemble the diversity of the African continent: West and Southern Africa, undergraduate students, graduate students, post-graduates, urban and suburban campuses. While each experience was different, here are some key takeaways.

LESSONS LEARNED

One of the major concerns about African business schools is pedagogical diversity and quality of teaching. Bisoux (2008) writes, "Many professors have had little exposure to modern business education, as a result, they still teach via the traditional lecture format rather than via case studies and hands-on projects."

In an article by Richard (2003), George Harlley, a former minister of transport in Ghana adds, "There are a few masters in business administration programs here, but most are mediocre. The teaching is still too theoretical and relies too heavily on textbooks and lectures. Pedagogy needs to move more toward hands-on consulting experiences and cases."

However, it is important to note that not all cases are uniform in quality or applicability. Accordingly, it is critical that the professor, especially the expatriate professor, select cases without cultural biases or where the cultural presuppositions are accessible by the African student.

There are growing numbers of publishers who produce cases with African settings. These include Harvard business publishing (United States), Ivey publishing (Canada), Darden business publishing (United States), IBS Case development center (India) and the European case clearing house (United Kingdom). Table 1 presents a list of case publishers and the various African nations represented in their case collections.

In addition, many management textbooks include mini-cases or short cases. However, these cases are often placed in the setting of the author. Accordingly, there is an abundance of American and European based case studies. Yet, these cases may be modified to become more relevant to the African social, cultural, and political environment. If teaching graduate students, students may be asked to provide a brief description of an issue that they are facing in their current positions or faced at a previous employer. These personal narratives can then provide the baseline for short cases or vignettes.

There is also a skill to teaching cases. Poorly implemented cases are just as ineffective in the classroom as poorly executed lectures. It is important to develop techniques to engage students in the case discussion. The professor must also pay careful attention to connecting the case to the core theoretical models so that students may extend the lessons learned beyond the particular setting of the case.

Since traditional lectures are the dominant pedagogical model in many African settings, one may need to include a sample case purely for the purpose of introducing the case study model. This will familiarize students with the technique and enable future case sessions to be more productive. To refine one's skills, organizations like Harvard business school's Christensen center for teaching and learning provides videos and documents for learning and using the case method. Understand that English (or French or Portuguese) is not always English (or French, or Portuguese)

It is critical and this is especially so for Americans to recognize that there can be major differences in English expressions. This goes beyond the basic differences between the seemingly odd way Americans spell words like "organizations".

Accordingly, it is equally important that one minimize native colloquialisms when lecturing or leading case

Table 1. Business case publishers.

Publisher	African nations	
Harvard Business School Publishing (USA)	Algeria, Angola, Botswana, Burkina Faso, Chad, Cote d'Ivoire, Djibouti, Egypt, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mali, Mauritania, Morocco, Mozambique, Nigeria, Rwanda, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe .	http://hbsp.harvard.edu/
European Case Clearing House (UK)	South Africa, Mauritania, Nigeria, Kenya, Botswana, Ghana, Zambia, Chad, Cameroon, Rwanda, Congo.	http://www.ecch.com/educators/
IBS Case Development Centre (India)	Egypt, Ghana, South Africa, Zimbabwe.	http://www.ibscdc.org/
Darden Business Publishing – University of Virginia (USA)	Chad, Cameroon, Nigeria, South Africa.	https://store.darden.virginia.edu/
Ivey Publishing (Canada)	South Africa, Egypt, Algeria, Tunisia, Libya, Morocco, Kenya, Sudan, Malawi, Tanzania, Uganda, Ghana, Zambia, Botswana	https://www.iveycases.com/

discussions. This includes acronyms, or "generally accepted" abbreviations. Always clearly define any acronym before frequent usage and utilize class discussion as a vehicle to assess student apprehension. If a student can summarize a concept in their own terms, it is more probable that they have acquired the concept.

However, while the use of one's native colloquialisms is discouraged, the acquisition and utilization of local colloquialisms is a useful mechanism for building rapport with students and for making the classroom feel more accessible for all. For example, one should attempt to learn basic greetings in the African languages. Students were both amused and pleasantly surprised to hear their visiting professor use the common Twi greeting, "Akwaaba." By selectively inserting local expressions, the lecturer can make the conversation more engaging and interactive.

LEVERAGE (DELICATELY) YOUR PERSONAL CONTEXT

As stated earlier, it is important to focus on the managerial context of your students. However, one should be willing to supplement the learning experience by integrating your personal context and experiences. In a session on the impact of the legal and regulatory environment on organizations, the discussion focused on the significance of political parties and their relationship to business climates.

While the initial teaching goal was to highlight some of the philosophical differences between Ghana's National Democratic Party (NDP) and New Patriotic Party (NPP), the Masters in business administration students were more excited to discuss the then-upcoming United States presidential election featuring republican Senator John McCain and Democrat Senator Barack Obama, the son of an African immigrant to the United States.So,instead of having the students assess the comparative business friendliness of the more left leaning, New Patriotic Party versus the more conservative National Democratic Party the discussion shifted to analyzing the impact of the election of either McCain or Obama on business in the United States. Drawing the parallels between the two major political parties in the United States and those in Ghana brought the conversation full circle and accomplished the original learning objectives.

Expatriate professors bring a wealth of unique experiences to their African setting. Thus, while the need to ground pedagogy in the African experience has been stressed, one should not completely ignore your personal context. The key is to avoid treating one's personal experience (especially for those professors from Europe and the United States) as the only experience. Instead, leverage one's personal context to better train a new cadre of African managers who will be comfortable in a variety of cultural environments. At the conclusion of each teaching engagement on the African continent, it can be affirmed that the students will teach the professor lessons that may be as valuable as the lessons taught by the professor.

CONCLUSION

Teaching management in Africa can be a rewarding and

professionally fulfilling experience. While it is important that African business schools continue to develop indigenously, there remains a critical role for expatriate professors. These individuals can provide new perspectives not just for students but also for African faculty and administrators.

Expatriate professors can share global best practices and begin to dissolve some of the many cultural barriers that unfortunately still exist. However, the expatriate professor should not just export his or her current course without adaptation to the African context. Just as American made car with the steering wheel on the left hand side will generate a less optimal driving experience in Johannesburg, a course that fails to appreciate the uniqueness of Africa will provide a disservice to students.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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Vol. 8(8), pp. 242-252, 28 April, 2014
DOI: 10.5897/AJBM11.194
ISSN 1993-8233

http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

The use of a hybrid ANP-VIKOR approach for establishing the performance evaluation model of e-business project

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Received 24th January 2011; Accepted 31st March 2014; Published 28 April 2014

These years, Taiwan enterprises face a rapidly changing environment. This transformation was brought about by both the pressure to take on an international and global outlook and the increase to apply more e-business or information communication and technology (ICT) solutions. Furthermore, the subjects of the e-business research increase day by day. In accordance with this tendency, Taiwan authority schemes out e-business policy and promotes representative e-business plan as a benchmark of achieving technological development and industrial competition. Therefore, the performance evaluation of e-business project is a key issue for policies. However, so far, there is no comprehensive mechanism to evaluate such kinds of project performance. Therefore, in this research, it is expected to reorganize the criteria for e-business project's performance evaluation, which were derived from discussion of the e-business performance evaluation, relevant literature of project evaluation and meetings with experts. Based on these criteria, the systematic evaluation model is constructed. This research is studied through Fuzzy Analytic Network Process (FANP) approach to construct achievements of appraisal pattern and VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) approach to rank the performance of project cases of Taiwan e-business. We look forward to the result that this research may be regarded as reference material to the government and enterprises.

Key words: E-business project, FANP, VIKOR, performance evaluation.

INTRODUCTION

The coming and impact of the era of digitalization and globalization make the e-business become major study recently. Furthermore, the boost of e-business broadly changes the chain of the internal parts of the enterprise with the external distributorship and business partners. With several trends of industrial development in recently couple years, the issues of studying e-business increases day by day, such as the rise of the related issues of the enterprise flow, the e-market place, the e-purchase, the supply chain management, the global logistics management, the coordination commerce, the enterprise resources plan, the customer relationship and the e-

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financial market (Kauffman and Walden, 2001; Ngai and Wat, 2002). To promote, influence and induce the development of industrial techniques, the government often enacts the industrial integral policy to advance the technical development, and to achieve the goal of technical development by a variety of technical policy; the most common way is the government assists the enterprise to proceed every project driven by coping with the situation and the business trends. So far, there is not a fit mechanism to evaluate such kinds of project performance. Thus, if we can set up a complete model to evaluate e-business project performance, for the enterprise (profit organization) and the government (non profit organization), it would be beneficial for them to push the execution of e-business projects, it could avoid not only improper planning of preliminary program which makes the following execution difficult, but also inappropriate resource distribution that makes unfavorable performance; and it could be used to examine and improve the program with worse performance.

Therefore, by searching for the related paper about the enterprise e-business in recent years and the current issue existing within the industrial application and government 's guidance and assistance, we try to retrieve the evaluation principle of executing enterprise e-business program in this study and further construct a systematic performance evaluation model of executing enterprise e-business program, and explain how to utilize this evaluation model with a representative case study of enterprise e-business for the reference of the government and enterprise.

This study constructs a performance evaluation model fit in generalizing the enterprise e-business program and utilizes the FANP and DEA to evaluate the model. Finally, the study will illustrate the application of this model with a representative case.

MATERIALS

In the aspects of enterprise e-business performance evaluation, Kenneth et al. (2005) bring out the concept of dimensional valuable chain activity, the level of EDI (customer and supplier) and the enterprise process integration. Claycomb et al. (2005) address on innovation, route, content and the construct aspect of organization evaluation. Sherry et al. (2006) suggest the industry, government, organization and culture should be considered. Performance is an index to evaluate the level of goal achievements of organization (or individuals) with two meanings: efficiency and effect (including satisfaction); however, the project performance management means "a management process of the level of goal achievements in organizations , including measurements, checks and improvements on project performance"; the performance is a part of performance management. In the preliminary development of project performance management. The focus is on the performance measurement which means the evaluation of the level of organization (or individuals) goal achievements. With the increasing related research, the performance measurement has gradually transformed into the performance management.

Manzoor (2004) points our enterprises need to know their project performance and broach a model structure to evaluate the relative project performance. It will assist the enterprises to compare their project performance and give formal reference for the decision maker to judge a factor that should be considered for a successful project and suggest a proper way, Project Deadline Factor (PDF), to quantify every evaluation factor for a more specific evaluation. Belmiro and Duarte (2006) broach a set of project combination evaluation system for assistance with the central public administration of Portugal to choose a operating program measured by a finance method. The research utilized the overall multiple attribute value function (OMVF) and structuralized the problem in advance with consideration of national revenue (including the support of economical activities, efficient policies and regional development) and so on.

Eddie et al. (2005) retrieve the factor for consideration of project choosing decision making such as the operation, management, finance, technology and circumstance and so on, from the related reference of projecting, project life cycle, project evaluation, investment decision making and the development of decision making model. They also take the Analytic Network Process (ANP) to construct the evaluation choosing model. In summary, the authors collect relevant issues for e-business projects as listed in Table 1.

On the other hand, the project evaluation is dominated by the linear algebra, linear programming and statistics, such as AHP (Saaty, 1980, 1996), ANP (Jaganathan et al., 2007) etc.

The structure of this study for the performance evaluation model is shown in Figure 1. Firstly, the important constructional aspects and their indices influencing the enterprise e-business project performance evaluation from the related researches were collected so as to extract the appropriate indices and classify them into five constructional aspects: scale, time, IT connection, financial index and the degree of achieving goals with 10 indices. Following this model to clarify the influence between principles, professionals in related areas were interviewed and they answered the questions about the influence correlation and level of importance between principles. Moreover, their fuzzy weightings were calculated by Csutora and Buckley's Lambda-Max FANP; fuzzy weighting was solved by Chen (2000)'s fuzziation-solving method, and then ANP completely imitating software, Super Decisions 1.6.0 was used to proceed the calculation of extreme relationship weighting. Finally, the referential weighting and sorting condition with experts' consensus of every evaluation principle was acquired and the criteria for a complete performance model were set up.

Furthermore, the ANP results of each criterion weight were used as a base for VIKOR approach to rank the performance of e-business projects (the 13 reprehensive cases of "Taiwan IT industry B-Plan") (Figure 1).

FANP Approach

In the evaluation principle, Buckley and Csutora（2001）thought it could not reflect the judgment of subject, and they combine the theory of fuzzy and the analysis of layer coming out as FANP. They unite the advantage of subjective judgment problems solved by the theory of fuzzy, and the benefit of easy analysis essence of problem in layer analysis. It was able to reflect the problem encountered within decision making analysis under certain circumstance.

This study will utilize Lambda-Max FANP and consult the application of steps of FANP broached by Mikhailov and Madan (2003) to proceed the project evaluation of enterprise e- business, whose step is: 1. Establishing the ANP network structure of groups, 2. Extracting the opinion of experts, 3. Checking the consistency of trend, 4. Defuzzy and ranking, and 5. Listing supermatrix.

Firstly, it was based on literature (Table 1) and related reference about the enterprise e-business performance and project evaluation. The layer structural model of enterprise e-business

Table 1. Summary of the performance evaluation criteria of e-business project.

Criteria	Principle	Definition	Related research
Time	Evaluation time	The time length from project start to end	Manzoor, 2004
	Commitment time	The estimated time from project start to end	Manzoor, 2004
	Real time	Project length (or cycle time)	Manzoor, 2004; Belmiro and Duarte 2006; Eddie, et al.2005
Scale	Range	Company scale	Claycomb et al. 2005; Sherry et al. 2006
	Team scale	Project cost	Claycomb et al. 2005; Manzoor, 2004
	Project scale	Input total human resource for project	Claycomb et al. 2005; Manzoor, 2004
IT Connectivity	Connectivity members	The total members joining B2B e-business system	Kenneth et al. 2005; Sherry et al. 2006
	Connectivity functions	The degree of function for e-business	Kenneth et al. 2005; Belmiro and Duarte, 2006
	Connectivity fathomable	The degree of connection for e-business	Kenneth et al. 2005; Sherry et al. 2006
Finance – Index	Profit	Net profit by project	Belmiro and Duarte, 2006; Eddie, et al.2005
	ROI	Return on Investment	Belmiro and Duarte, 2006; Eddie, et al.2005
Finance – Efficiency	Cost-income ratio	Cost-income ratio of project	Belmiro and Duarte, 2006; Eddie, et al.2005
	Investment Value	Investment value of project	Belmiro and Duarte, 2006; Eddie, et al.2005
Object Achievement	KPI achievement	KPI achievement of project	Manzoor, 2004; Claycomb et al. 2005; Chen and Wang, 2010

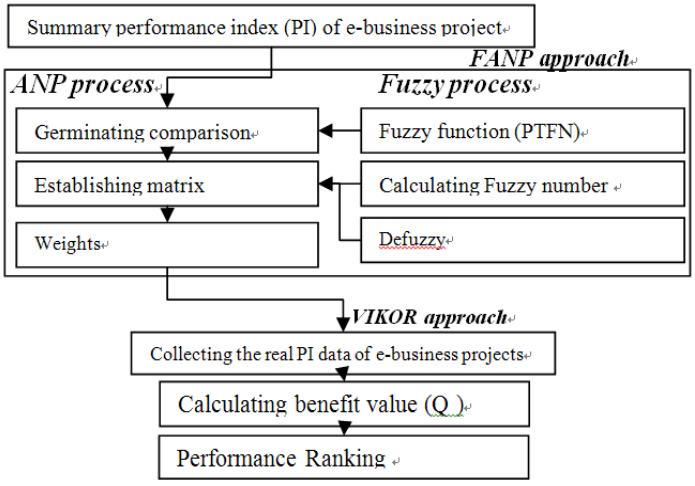

Figure 1. Research pattern.

evaluation constructed by this study is shown in Figure 2. By interviewing with experts with plenty of experiences in correlated areas and asking them to answer the questions of correlation and the level of importance for the principles, the authors figure out the relationship of groups as shown in Figure 3.

According to the evaluation of model for the structure (step 1: establish the structure of network for groups and principles), the authors have interviewed the experts for their opinions about the relationship of principles and the influence of intensifying to ensure the relationship of interdependence among principles. At least 3~7 of them are the senior experts of industry or government agency with abundant experience, including: pushing the related enterprise e-business project in unit A of government.

B works for in the consultative institution (Unit B). This institution executes the plans which are assigned by the government. C is the professional consulter for the information technology industry. They work as the seniority of expert of each area for more than 10 years. We sent 9 questionnaires to these experts (9 experts). These questionnaires are valid, and the rate of receiving is 100%.

After combining two principles for the correlatives evaluation of importance value we assumed every expert is expressed by semantic variables; we integrated the opinion of 9 experts with the average geometry (Csutora and Buckley, 2001). These semantic variables can be expressed by positive triangular fuzzy number (PTFN) as shown in Figure 3, and referred to Jaganathan et al. （2007）semantic fuzziation method; we set the permitable fuzzy residue of two extreme semantic scales as 0. And the fuzzy residue of other semantic scale is 1. (Step 2 and 3: the integration of group opinions and establishing positive fuzzy reciprocal matrix T).

The five groups of scale, time, IT connections, level of goal achievement and financial indices are represented individually in G1~G5. Besides the characteristic value computation and test of consistency, other calculating steps are represented by computing process examples of paired comparisons based on scale group, and the others are computed in the same way. Table 2 shows the positive reciprocal value of preliminary scale on questionnaires answered by experts; after the triangular fuzziation, the scale value has transformed into a 5x15 matrix. In the principle of scale group, the group needs to proceed paired comparison as “scale”, “time”, ”IT connection”, ”level of goal achievement” and ”financial indices”. Based on the last step, we integrate the opinion of every expert with

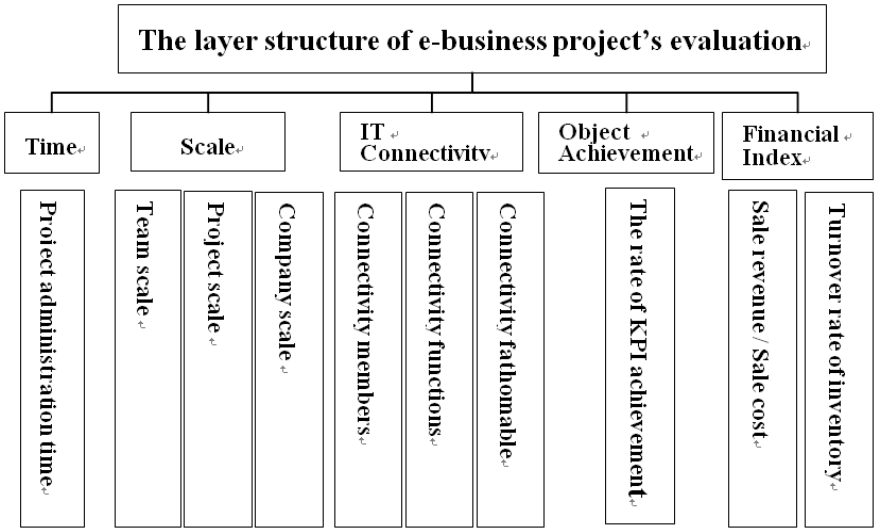

Figure 2. The layer structural model.

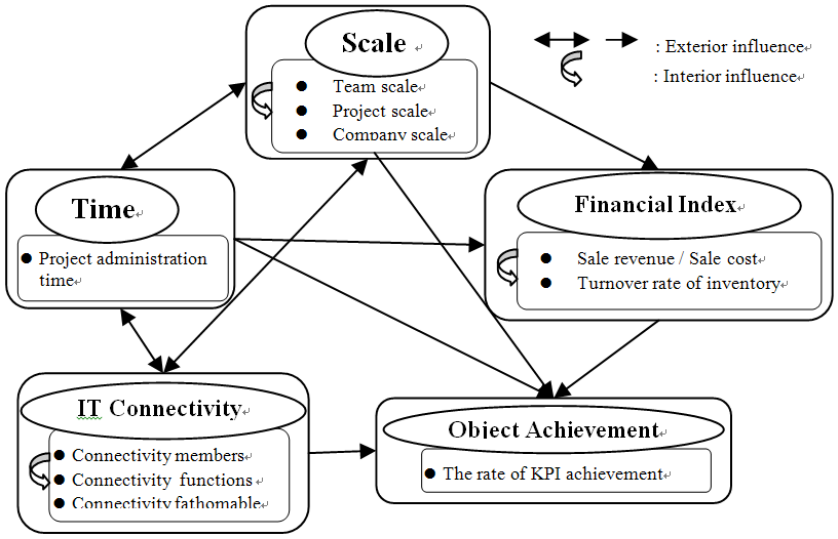

Figure 3. FANP- Network evaluation model-group interrelatedness.

Table 2. The ratings by valuator under scale (G1).

	G1			G2			G3			G4			G5		
G1	1	1	1	1/6	1/5	1/4	3	4	5	1	2	3	1	2	3
G2	4	5	6	1	1	1	1	2	3	1	2	3	2	3	4
G3	1/5	1/4	1/3	1/3	1/2	1	1	1	1	1/5	1/4	1/3	1/6	1/5	1/4
G4	1/3	1/2	1	1/3	1/2	1	3	4	5	1	1	1	1/5	1/4	1/3
G5	1/3	1/2	1	1/4	1/3	1/2	4	5	6	3	4	5	1	1	1

Note: G1 - Scale, G2 - Time, G3 - IT connectivity, G4 - Object Achievement, and G5 - Financial Index.

the average geometry method, and then set up the fuzzy positive reciprocal matrix T as shown in Table 3.

In the test of characteristic values and consistency between groups and principles, to make sure if the item of questionnaires in this study achieves the standard of consistency, we can utilize the characteristic value and characteristic vector got from paired comparison matrix, take the Consistency index (C.I.) and Consistence Ratio (C.R.) to evaluate the level of consistency in

Table 3. Aggregation of the weight of scale to get fuzzy weight.

T	G1			G2			G3			G4			G5		
G1	1.0000	1.0000	1.0000	0.4947	0.4229	0.8137	2.0377	3.1395	4.1860	1.2857	2.3478	3.3750	1.4211	2.5116	3.5526
G2	1.2290	2.3648	2.0216	1.0000	1.0000	1.0000	1.7419	2.8421	3.8849	1.8305	2.9670	4.0299	1.3171	2.4000	3.4395
G3	0.2389	0.3185	0.4907	0.2574	0.3519	0.5741	1.0000	1.0000	1.0000	0.4675	0.6490	0.9643	0.3462	0.4463	0.5806
G4	0.2963	0.4259	0.7778	0.2481	0.3370	0.5463	1.0370	1.5407	2.1389	1.0000	1.0000	1.0000	0.4500	0.5934	0.8308
G5	0.2815	0.3981	0.7037	0.2907	0.4167	0.7593	1.7222	2.2407	2.8889	1.2037	1.6852	2.2222	1.0000	1.0000	1.0000

Table 4. RCI values of sets of different order.

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R.I	N/A	N/A	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.58

Table 5. Consistency ratio of the paired comparison matrix.

Criteria	*n*	*C.I.*	*R.I.*	*C.R.*	Under Criteria	*n*	*C.I.*	*R.I.*	*C.R.*
				0.0496	Team scale (C1)	3	0.0187	0.58	0.0324
Scale (G1)	5	0.055	1.12		Project scale(C2)	4	0.0682	0.9	0.076
					Company scale (C3)	4	0.0763	0.9	0.085
Time (G2)	4	0.895	0.9	0.099	Project administration time(C4)	3	0.0107	0.58	0.0185
				0.0795	Connectivity members (C5)	2	0	0	0
IT connectivity(G3)	5	0.089	1.12		Connectivity functions (6)	2	0	0	0
					Connectivity fathomable (7)	2	0	0	0
Financial Index	2	0	0	0	N/A			-	

Table 6. Fuzzy weighted matrix.

	G1			G2			G3			G4			G5		
G1	0.3283	0.2219	0.2002	0.2159	0.1672	0.2203	0.2703	0.2917	0.2969	0.2222	0.2715	0.2912	0.3134	0.3613	0.3778
G2	0.4035	0.5247	0.4048	0.4365	0.3955	0.2708	0.2311	0.2641	0.2755	0.3163	0.3430	0.3477	0.2905	0.3453	0.3658
G3	0.0784	0.0707	0.0983	0.1124	0.1392	0.1554	0.1326	0.0929	0.0709	0.0808	0.0750	0.0832	0.0763	0.0642	0.0617
G4	0.0973	0.0945	0.1557	0.1083	0.1333	0.1479	0.1376	0.1431	0.1517	0.1728	0.1156	0.0863	0.0992	0.0854	0.0883
G5	0.0924	0.0883	0.1409	0.1269	0.1648	0.2056	0.2284	0.2082	0.2049	0.2080	0.1948	0.1917	0.2205	0.1439	0.1063

questionnaire.

According to the so-called randomized index R.I. broached by Saaty's study, it can be used to adjust the variation of different C.I. values from different layer numbers; the number of layers n and its corresponding randomized index values are shown in Table 4.

From Table 5, it can be understood the level of consistency of every construct aspect in this study is considerably ideal (C.R.< 0.1, C.I.≦0) and fits the demand of general research; it means there is no paradox or inconsistency in the questionnaire design and subject answering process in this study and conforms to the demand of consistency test.

Based on the former fuzzy positive reciprocal matrix T, we compute the fuzzy weighting value in Lambda-Max's type of positive fuzzy number ($\tilde{T}$) as shown in Table 6. Then we integrate W_m and $W_{l,u}$ to get a positive triangular fuzzy weighting matrix $W^T = \left[\tilde{w}_i^t\right]$, $\tilde{w}_i^t = \left(w_l^t, w_m^t, w_u^t\right)$, and proceed the normalization to get the normalized fuzzy weighting shown as Table 7.

Furthermore, we utilize the fuzziation-solving method broached by Chen (2000), $R_t = \frac{d^-\left(\tilde{r}_t^{l,u},0\right)}{d^-\left(\tilde{r}_t^{l,u},0\right)+d^-\left(\tilde{r}_t^{m},1\right)}$, to get the fuzziation-solving value of every fuzzy weighting matrix. The greater t R_t is, the more prior the sequence of this evaluation principle is. It is shown in Table 8.

In Table 8, the ranking of the weights of the criteria is: scale (0.271), time (0.166), financial index (0.12134), object achievement (0.350), and IT connectivity (0.092). These results manifest the most influential construct for the e-business projects to enterprise as scale, and the least influential is IT connectivity.

Table 7. Aggregate of the fuzzy weighted and normalized.

	$\tilde{w}_i^{\,t}$			$\tilde{w}_i^{\,t_N}$		
	l	***m***	***u***	***l***	***m***	***u***
G1	0.266097	0.254207	0.270224	0.2737898	0.2621185	0.2773733
G2	0.3270038	0.3651269	0.3287617	0.3364573	0.3764904	0.3374597
G3	0.0936652	0.0848642	0.08894	0.096373	0.0875053	0.091293
G4	0.1199741	0.1122195	0.1216466	0.1234425	0.115712	0.124865
G5	0.1651626	0.1533996	0.1646528	0.1699374	0.1581737	0.169009
Total	0.9719	0.9698	0.9742	1	1	1

Table 8. Defuzzy weighted.

	α = 0	**α = 1**	R_t	R_{t_N}	**Rank**
df1=G1	0.271172	0.728935	0.271143	0.271016	1
df2=G2	0.165793	0.83431	0.1657756	0.165698	2
df3=G3	0.091796	0.908283	0.0917884	0.091745	5
df4=G4	0.350632	0.650131	0.3503643	0.3502	4
df5=G5	0.121406	0.878669	0.1213973	0.12134	3
Total.	1.000799	4.00033	1.0004686	**1**	

Note: G1 - Scale, G2 - Time, G3 - IT connectivity, G4 - Object Achievement, and G5 - Financial Index.

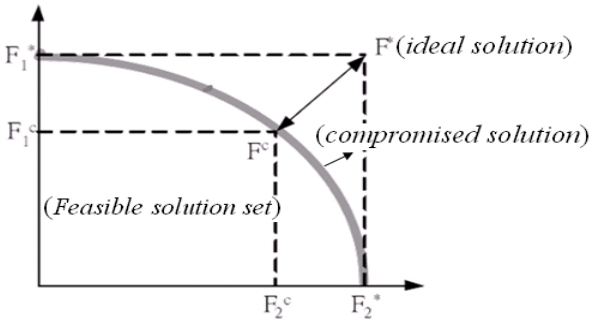

Figure 4. Ideal solution and compromised solution.

VIKOR approach

Based on the weights of criteria as shown in Figure 2, the following procedure is to evaluate the level of B Plan projects through VIKOR approach. Even though SFA & DEA (Golany and Roll, 1989) have been widely used in MCDM implementations meant to study operational performance in past research, the explanatory power of the rankings is relatively weak due to the difficulty of identifying significant differences or identical performances when the rankings are all nearly identical. Hwang and Yoon (1981) used compromised solutions to develop TOPSIS, a multi-attribute decision method with aggregations; however, when there are conflicts or offsets among measurement items, the results may be biased, and therefore cannot reflect the closeness between each solution and the ideal solution(s).To mend the shortcomings of TOPSIS, Opricovic (1998) proposed the VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) method, which is a compromise to multi-criteria sequencing method. (Opricovic and Tzeng, 2007; Tzeng et al., 2005). In other words, the decision makers may make a compromise and choose a plan that is closest to the ideal solution, while they cannot obtain an optimal goal at the same time. In Figure 4, F_1^* (the ideal value of the first assessment criterion) and F_2^* (the ideal value of the second criterion) cannot reach F*(ideal solution) at the same time. The compromised solution is a point on the curve. F^c is closest to the ideal solution (F^*) among all non-inferior solutions. Therefore, F^c is closest to the ideal solution (F^*) among all non-inferior solutions. Therefore, F^c is a viable solution ($F^c = (F_1^c, F_2^c)$).

The compromised ranking algorithm of VIKOR consists of the following steps:

Step 1: Determine the ideal solution (f^*) and the negative ideal solution (f^-) for all measured criteria. I_1 in equations (1) and (2) is the benefit criteria set. The larger it value is, the better. I_2 is the cost criteria set. The smaller it value is, the better.

$$f_i^* = [(\max_j f_{ij} | i \in I_1), (\min_j f_{ij} \mid i \in I_2)], \forall_i \quad (1)$$

$$f_i^- = [(\min_j f_{ij} | i \in I_1), (\max_j f_{ij} | i \in I_2)], \forall_i \quad (2)$$

Step 2: Calculation of S_j and R_j

$(f_i^* - f_{ij})/(f_i^* - f_i^-)$ in Equations (3) and (4) is the distance ratio of the i criterion of j to the ideal solution. w_i is the weight obtained by using the i criterion. By adding all criteria in j together, we can get the maximum "collective" benefit (S_j). R_j is the ratio criterion selected from j and is farthest from the ideal solution. The smaller S_j and R_j

Table 9. Performance index list.

Criteria	Formula
Team efficiency	Projects scale / Team scale
Project efficiency	Total connected B2B number / project length (months)
IT connectivity	(Total connected B2B number) +(ERP to ERP firms / connecting B2B number) / 2
Financial index	Turnover rate of inventory
KPI achievement	Total Project outcome (i.e. KPI)

are, the better j will be.

$$S_j = \sum_{i=1}^{n} w_i (f_i^* - f_{ij}) / (f_i^* - f_i^-) \quad (3)$$

$$R_j = \max_i \left[w_i (f_i^* - f_{ij}) / (f_i^* - f_i^-) \right], \ j = 1,2, \ldots J \quad (4)$$

Step 3: Calculation of Q value

Q_j is the benefit value of j combining collective (S_j) and individual (R_j). Its calculation is shown in Equation (5). The parameter v is the coefficient for decision-making mechanism. When it is larger than 0.5, v will represent the decision of the majority of the people. When it is equal to 0.5, v represents the decision that is passed reluctantly. When it is smaller than 0.5, v means that the decision is not approved.

$$Q_j = v(S_j - S^*) / (S^- - S^*) + (1 - v)(R_j - R^*) / (R^- - R^*) \quad (5)$$

Where $S^* = \min_j S_j$, $S^- = \max_j S_j$, $R^* = \min_j R_j$, $R^- \max_j R_j$

Step 4: Rank and improve the alternatives, sort by the values S, R, and Q, in decreasing order and reduce the gaps in the criteria. The results are three ranking lists, with the best alternatives

Step 5: Propose a compromised solution. For a given criteria weight, the alternatives (a≧), are the best ranked by measure Q (minimum) if the following two conditions are satisfied:

C1: “Acceptable advantage”: Q(a″) - Q(a′) ≧DQ, where a″ is the alternative with second position in the ranking list by Q; DQ = 1/(J-1); J is the number of alternatives.
C2. ‘‘Acceptable stability in decision making”: Alternative a′ must also be the best ranked by S or/and R. This compromised solution is stable within a decision making process.

If either one of the above two requirements fails to be satisfied, a compromised solution can be worked out by the following means: (1) If the first requirement fails to be satisfied, a′ and a″ shall be taken as the compromised solution. (2) If the second requirement fails to be satisfied, a′, a″, … , a(M) shall be taken as the compromised solution.

Case study

The “A, B, C, D, and E plan” is the first one which the Taiwan government promotes the domestic enterprise to develop the electronic technology in large-scale with policy plans. The government hopes to advance the ability of industry e-business by the improvement of electronic task ability between enterprises, advance the enterprise operating model, increase the industrial competition power, and connect the upstream, midstream and downstream to form the chain reaction and extend the successful experience to different industries and service industry (including information service sector). After pushing of more than four years, the plan has finished in 2004 and brought out more than NT $ four billions of the involvement of resource comes from the government and people. Because the B plan is bigger B2B e-business projects, this research adopts the B plan as the application case. There are 13 PC/notebook manufacturers joining the B plan; besides the announced public issues, the type of enterprise has divided into three categories: system of manufacture, NB and boards, and peripheral products; and the system manufacturers are A~E company, the NB and motherboard manufacturers are F~J company, and other peripheral manufacturers are K~M company.

This study is based on the value chain structure broached by Chen and Chang (2004)’s analysis of the real situation of information industry e-business as the principle of sorting the value chain activity of every manufacturer. The primary activities of system of manufacture are research and development, component purchase, materials logistics, production, product logistics, midstream trader’s purchase and service after selling, and the component purchase and midstream trader’s purchase are the primary core activity, and the main consideration is based on their purpose of joining the plan. The primary activities of NB and motherboard manufacturer are research and development, component purchase, farming out, product logistics, the midstream trader purchase, and retailer/ agent marketing, and the component purchase and midstream trader’s purchase are the primary core activity; the main consideration is based on their purpose of joining the plan. The primary activities of peripheral manufacturers are component purchase, materials logistics, production, product logistics, the midstream trader purchase, retailer/agent marketing, and service after selling, and the component purchase, midstream trader’s purchase and retailer/ agent marketing are the primary core activity; the main consideration is based on their purpose of joining the plan. Overall, this three have similar activities of value chain.

VIKOR ranking

According to the compromised ranking algorithm of VIKOR approach, the “S” value of equation (3) and “R” of equation (4) need to use the FANP weights (Table 8) as a base for each criteria of VIKOR. On the other hand, through these five criteria of performance evaluation for e-business projects as listed Table 1, this study by in-depth interview experts of Taiwan B-plan firms presents a conversion formula of each criterion as a performance index for e-business projects (Table 9).

Listed in Table 10 is the performance index (PI) information, which is real data of five e-Business projects of Taiwan’s B- Plan. These PI values, such as IT Connectivity, Financial Index, and KPI achievement are average value of five consecutive years, while TE represents project team executed efficiency, or, the ratio of project

Table 10. Summary of case performance index (PI) information.

PI / Project	Team Efficiency	Project Efficiency	IT Connectivity	Financial Index	KPI Achievement
A	1.2307	11.1297	115.0308	0.4159	20.1580
B	0.4887	4.2344	48.0317	0.4828	15.2423
C	0.5055	1.7225	14.5785	0.4898	24.9730
D	0.2747	9.5622	129.0831	0.9996	84.8936
E	1.3530	1.6868	22.7756	15.2040	127.3053
F	0.8066	2.5936	24.3145	5.2879	54.4471
G	1.2233	2.7589	28.5186	44.8723	45.6187
H	0.4103	0.7458	8.4633	1.2095	34.7540
I	0.2310	1.0795	11.1837	0.3599	37.5708
J	0.7990	3.4118	25.9253	0.4898	69.1528
K	0.3858	5.4926	46.4694	10.2360	54.4471
L	1.4964	0.1666	1.5829	19.3524	37.5708
M	0.8089	0.8058	8.3335	0.6397	49.9353

Table 11. The normalized value of PI; the value of fi* and fi$^-$

PI / Project	Team Efficiency	Project Efficiency	IT Connectivity	Financial Index	Kpi Achievement
A	0.3899	0.6452	0.5945	0.0079	0.0961
B	0.1548	0.2455	0.2482	0.0092	0.0727
C	0.1602	0.0998	0.0753	0.0093	0.1191
D	0.0870	0.5543	0.6671	0.0190	0.4047
E	0.4286	0.0978	0.1177	0.2896	0.6070
F	0.2555	0.1503	0.1257	0.1007	0.2596
G	0.3875	0.1599	0.1474	0.8548	0.2175
H	0.1300	0.0432	0.0437	0.0230	0.1657
I	0.0732	0.0626	0.0578	0.0069	0.1791
J	0.2531	0.1978	0.1340	0.0093	0.3297
K	0.1222	0.3184	0.2402	0.1950	0.2596
L	0.4740	0.0097	0.0082	0.3686	0.1791
M	0.2563	0.0467	0.0431	0.0122	0.2381
Total	3.1723	2.6312	2.5030	1.9057	3.1280
F*	0.4740	0.6452	0.6671	0.8548	0.6070
F-	0.0732	0.0097	0.0082	0.0069	0.0727

Note: The meaning of PI is described in Table 2.

finding and staff costs, and PE stands for project efficiency (that is, the project length).

Listed in Table 11 is the ideal solution (f^*) and the negative ideal solution (f^-), which is calculated by equation (1) and (2). In addition, this study also applies the equation (3) and (4) to calculate S_j and R_j (Tables 12~13; Figure 5.

Finally, this study obtains the ranking of performance using equation (5) as listed in Table 13. In Table 12, the rankings of the benefit value Q_j of the e-business project A~M are: project G, project L, project E, project K, project A, project F, project D, project J, project M, project B, project C, project H, and project I.

In Table 13 and Figure 5, the acceptable conditions and the threshold "DQ" value, that is, 1/ (13-1) = 0.0833, where j=13 are seen. Hence, we could calculate the performance values of top 1 case (Table 14). We identify case G as the benchmark. This finding is consistent with previous studies (Opricovic and Tzeng, 2007).

Furthermore, a closer look at case G indicates that this case has a better strategy and allocation for each criterion. Overall, while they are establishing their e-business project, they catch the follow key points: 1. having a clear project target and project cost balance for e-business, 2. realizing business model is part of e-business projects, 3. having a better KPI monitor scheme, 4. closely connective with B2B partners through e-business project, 5. CEO is project leader, 6. having a clear connection classification, and more

Table 12. The value S_j, S^* and S^-

PI / Project	Team Efficiency	Project Efficiency	IT Connectivity	Financial Index	KPI Achievement	Sj
A	0.210	-	0.110	0.999	0.956	0.5328
B	0.796	0.629	0.636	0.997	1.000	0.8489
C	0.783	0.858	0.898	0.997	0.913	0.8968
D	0.965	0.143	-	0.986	0.378	0.6764
E	0.113	0.861	0.834	0.667	-	0.4833
F	0.545	0.779	0.822	0.889	0.650	0.7424
G	0.216	0.764	0.789	-	0.729	0.3458
H	0.858	0.947	0.946	0.981	0.826	0.9201
I	1.000	0.917	0.925	1.000	0.801	0.9551
J	0.551	0.704	0.809	0.997	0.519	0.7524
K	0.878	0.514	0.648	0.778	0.650	0.7339
L	-	1.000	1.000	0.573	0.801	0.5554
M	0.543	0.942	0.947	0.994	0.690	0.8219

Table 13. The value of R_j , Q_j

PI / Project	Team Efficiency	Project Efficiency	IT Connectivity	Financial Index	KPI Achievement	Rj	Qj	Rank
A	0.057	-	0.010	0.350	0.116	.3498	0.652	5
B	0.216	0.104	0.058	0.349	0.121	.3492	0.911	10
C	0.212	0.142	0.082	0.349	0.111	.3492	0.950	11
D	0.262	0.024	-	0.345	0.046	.3452	0.760	7
E	0.031	0.143	0.076	0.233	-	.2334	0.352	3
F	0.148	0.129	0.075	0.311	0.079	.3114	0.739	6
G	0.058	0.127	0.072	-	0.088	.1265	0.000	1
H	0.233	0.157	0.087	0.344	0.100	.3435	0.956	12
I	0.271	0.152	0.085	0.350	0.097	.3502	1.000	13
J	0.149	0.117	0.074	0.349	0.063	.3492	0.831	8
K	0.238	0.085	0.059	0.273	0.079	.2725	0.645	4
L	-	0.166	0.092	0.201	0.097	.2008	0.338	2
M	0.147	0.156	0.087	0.348	0.084	.3480	0.886	9

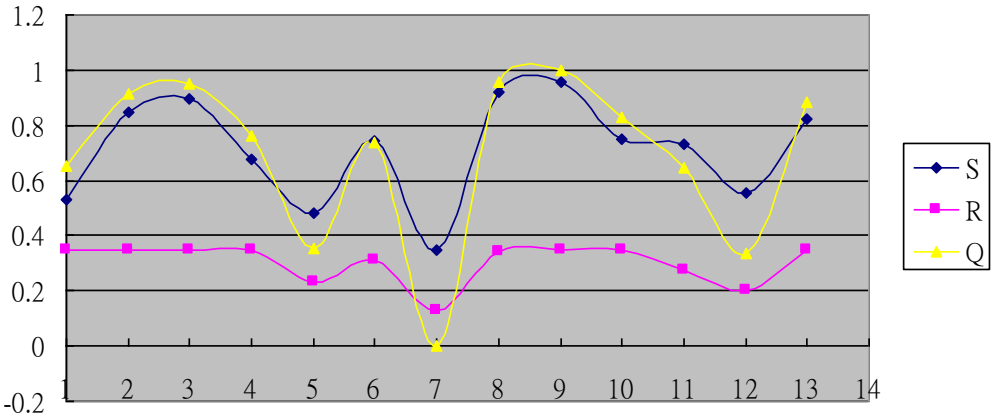

Figure 5. The S, R, and Q value line.

Table 14. The performance values of 2 top cases.

Rank 1	Q(a′)	Rank 2	Q(a″)	Q(a″)- (a′)	DQ	Q(a″)-Q(a′)≧DQ
Project G	0.000	Project L	0.338	0.338	0.0833	Yes

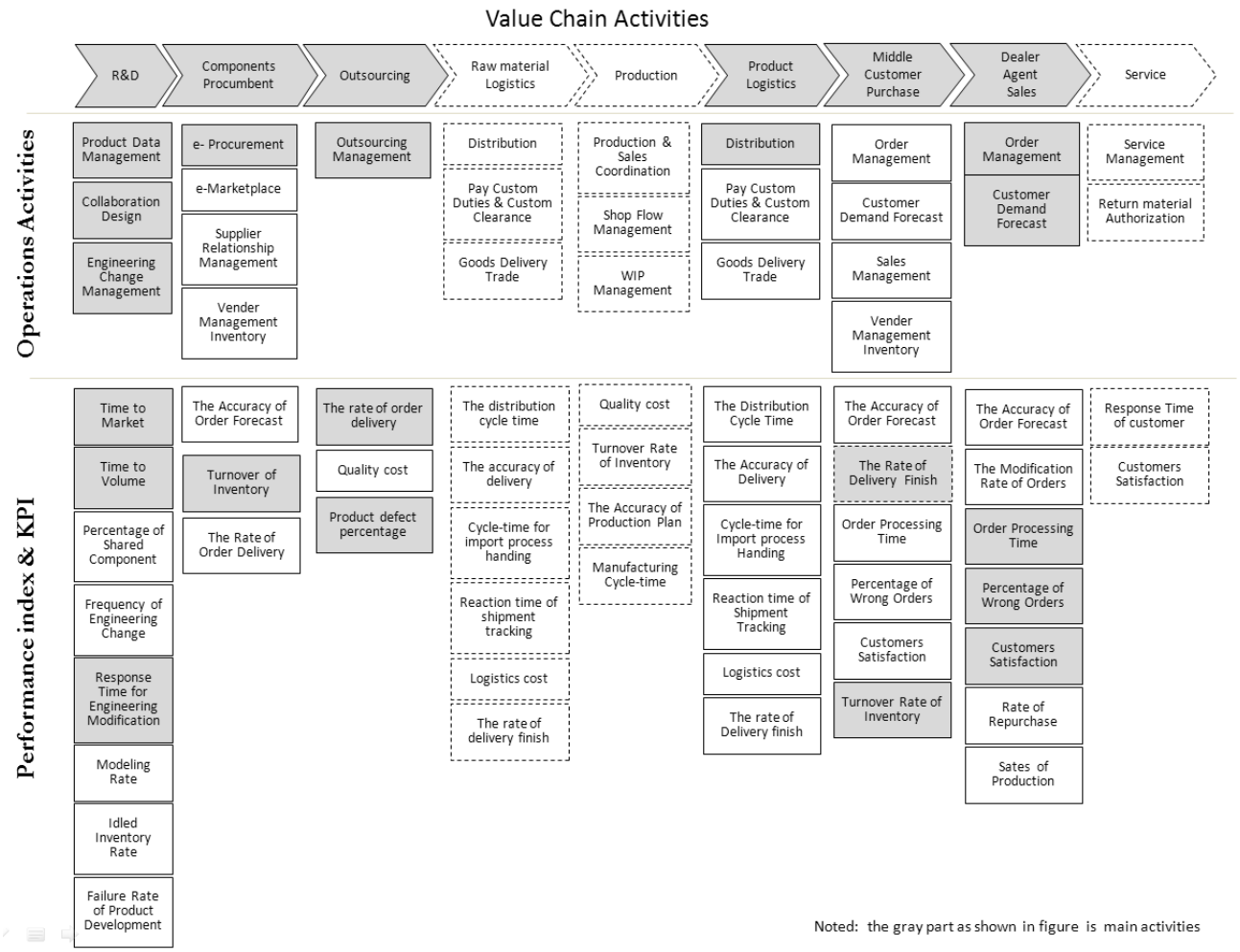

Figure 6. Case G e-business activities, sub-activities and the KPI for each activity of value chain in sub-industry of NB&PC manufacture.

deeply combine each activity of value chain (Figure 6).

RESULTS

This research analyzed e-business project performance for Taiwan B-plan cases through a VIKOR approach, which is based on the five criteria of FAHP approach. Thus the authors calculate the performance ranking order as listed in Table 6 from VIKOR approach.

Firstly, This study used the FANP real examination result in this study so it can be learned the most influential is scale group (G1), the second is level of goal achievement group (G4), the third is IT connection group (G3), then the following is time group (G2), and financial index group is the last with relative inefficiency (g5).

Secondly, this research is based on the results by FANP approach to calculate the performance information for 13 B-plan projects by five formula of performance indexes as listed in Table 2.

Finally, this study employs VIKOR approach to rank 13 projects' performance. The study shows the Q(a″)-Q(a′) value of project G (Q rank 1) is over DQ value (0.0833). Hence, the project G maps out several critical successful strategies of e-business projects: a clear plan by each criterion, a strong teamwork and project targets, projects

which match firms' vision, and projects which is more supported by firm's CEO.

DISCUSSION AND CONCLUSION

Based on the result of this research derived from the academic and industrial viewpoints, it is proposed to have an e-business project performance evaluation model which may be comprehensive, representative, integral and worthy of reference material not only for enterprises (or software service firm) to build an effective and efficient e-business projects but for the government to propel industrial policies as well. In the future, other studies could refer to our study as the basis for extending related research (such as comparison to the results by DEA approach, etc.) to enrich evaluation model.

Conflict of Interests

The author(s) have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors are grateful to get many valuable aspects from CEOs and experts who work for the famous e-business projects corporations and the ministries of government (ABCDE plan) in Taiwan.

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Vol. 8(8), pp. 253-269, 28 April, 2014
DOI: 10.5897/AJBM11.2000
ISSN 1993-8233

http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

Leaving home: Relocation choices of South African multinational enterprise (MNEs)

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Received 2nd August, 2011, Accepted 7th April, 2014; Published 28 April 2014

As multinational enterprise (MNEs) from emerging markets grow into maturity they face significant challenges surrounding their identities and home country bases and, as a result, we see them making different choices. National champions choose to retain their corporate headquarters and identity from their emerging market homes while corporate emigrants relocate their head-offices abroad. Targets of mergers and acquisitions (M and A) may move to the acquirer's home or stay where they were born. Through an examination of South African-born firms that are cross-listed on both the Johannesburg securities exchange and one other exchange, we identify the differences between these evolutionary paths and discuss the drivers and constraints on relocation decisions.

Key words: South Africa, emerging markets, multinational enterprise, location advantage, headquarters.

INTRODUCTION

A shifting balance of economic power towards emerging markets has been evident for some time as the world's economic centre of gravity has moved East and South, away from organization for economic cooperation and development (OECD) countries and towards emerging economies (OECD, 2010). More recently, we have begun to witness the growing economic power of businesses coming from these emerging markets. As such, the location advantage of developed markets and the firms within their borders is changing. In 2005, 34 of the fortune global 500 companies were from emerging markets. Only four years later, this number had risen to 73 (Fortune, 2009). Even this increase, however, understates the true nature of the transition that is underway. Mature MNEs from developed markets have been able to retain their dominant positions through the acquisition of emerging market firms and this is a partial explanation for the limited representation of emerging market multinational enterprises (EMNEs) in the global 500 ranking. A more important reason may be the relocation of EMNEs themselves, from their emerging market homes to developed countries. This latter phenomenon has yet to receive much attention from researchers.

EMNEs have become key actors in foreign direct investment and cross-border acquisitions too (Guillén and García-Canal, 2009). However, there is no scheme or taxonomy for describing the strategy of 'infant MNEs' as they embark on internationalisation; this case falls between

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the cracks (Ramamurti, 2009). Extant research has focused on the location choices of MNEs in aggregate and has related this to individual factors, such as taxation (Barrios et al., 2008; M. Desai and Hines, 2002; Devereux and Maffini, 2006; Voget, 2008). While the phenomenon of EMNEs moving their headquarters to developed countries has been observed, current research has not considered the combination of factors that motivate or constrain emerging market firms in their headquarters location choices (Bel and Fageda, 2008; Birkinshaw et al., 2006; Braunerhjelm, 2004; Brouwer et al., 2004). EMNEs do not bear the costs of relocation without reason, and the underlying logic of location advantage for headquarters in developed markets requires verification. Such an examination is especially timely given the vigorous and continuing debate surrounding the reasons for EMNE relocation (McNulty, 2010).

Although emerging markets are not homogeneous, they share some locational disadvantages, such as weak institutional environments, property rights regimes, legal systems, and others (Guillén and García-Canal, 2009). Differences between EMNEs themselves are also notable. Their origins, industries, competitive advantages, markets and internationalisation paths vary widely (Ramamurti, 2009). While many EMNEs develop firm specific abilities to compensate for their home-country location disadvantages (Guillén and García-Canal, 2009), others relocate their headquarters to developed countries, presumably in the pursuit of location-based advantages.

As the significance of cross-border trade grows, and firms internationalise, EMNEs may relocate to Industrialised countries for asset-seeking and market-seeking reasons; for example, Anglo American moved from South Africa to Britain and Mittal Steel moved from India to the Netherlands. Relocation may be a strategic necessity in order to allow greater access to capital and other resources; as typified by South African Breweries relocating to London “seeking access to capital markets better endowed than those at home”(Hoover's, 2010).

Countries, or cities, compete to attract MNEs and extract rents from headquarters located within their borders, creating “a developing market for international headquarters” UNCTAD (2003a). Some firms, however, retain their indigenous headquarters, grow very large and continue to manage global operations from outside “the triad” (Rugman, 2008), despite the supposed disadvantages of their locations, firms such as Petronas of Malaysia or document type conference paper authors Vladimir Alvarado (PDVSA) of Venezuela have stayed at home. These EMNEs are often supported by their home country governments and are often natural resource specialists.

The purpose of this paper is to better understand the phenomenon of firm relocation as it applies to emerging market firms. We describe the relocation decisions made by South African firms in light of prior research and assess the applicability of such work in an emerging market context. We outline the different expansion paths taken by EMNEs in an era of globalization and review the locational advantages of emerging versus developed markets. Based on these advantages, we discuss and categorise the predictors of MNE behaviour and highlight the likely implications for firms from emerging markets. We then examine these implications in the context of South African firms, and draw conclusions from the analysis.

Internationalization paths

As an MNE progresses from “infancy” to “adolescence” to “maturity”, the consequences of its birthplace change. The importance of home-country advantage declines as an MNE evolves, regardless of its nationality (Ramamurti,2009). As such, the country of origin may have obsolescing relevance for an MNE over time, in terms of value chain elements, supply of senior management, capital supply or relative revenue. What may become more important is the country in which the MNE chooses to live.

In figure 1 below, three possible expansion paths for an EMNE are identified as globalization takes hold in its home country: relocate, remain at home or be acquired. The firms that pursue such options are labelled as corporate emigrants, national champions and targets, respectively. We speculate that different paths, as depicted, will have different growth trajectories[1]. Becoming a target may be associated with slower growth, while becoming a corporate emigrant may be a cause (based on managerial ambition) or a consequence (due to access to a larger global market) of more accelerated growth than would be the case for national champions.

The “corporate emigrant” is conceptualised as a firm that relocates its headquarters to obtain location specific advantages while customer facing business units remain in place. The “national champion” is a firm that does not relocate and bears the costs, benefits, of this decision. The “target” is acquired by another MNE, which results in an effective transfer of headquarters functions. The target could then be seen as an “outside-in” firm that locates its headquarters and operations separately – managing from the “outside”, with operations “in” the country.

The EMNE may choose to relocate its head office to a developed country in order to take advantage of the economies of agglomeration, such as access to physical and human capital (Dunning, 1998) as well due to increasing accountability to international stakeholders (Birkinshaw *et al.*, 2006), while the customer facing business units remain elsewhere.

Three other investment types may explain the “outside-in” phenomenon (Dunning and Lundan, 2008):

[1]This question of growth trajectories, and its empirical verification, is deserving of further study, but is outside the scope of this paper. The preliminary question, that is discussed here, is how these different options describe firm behaviour in practice.

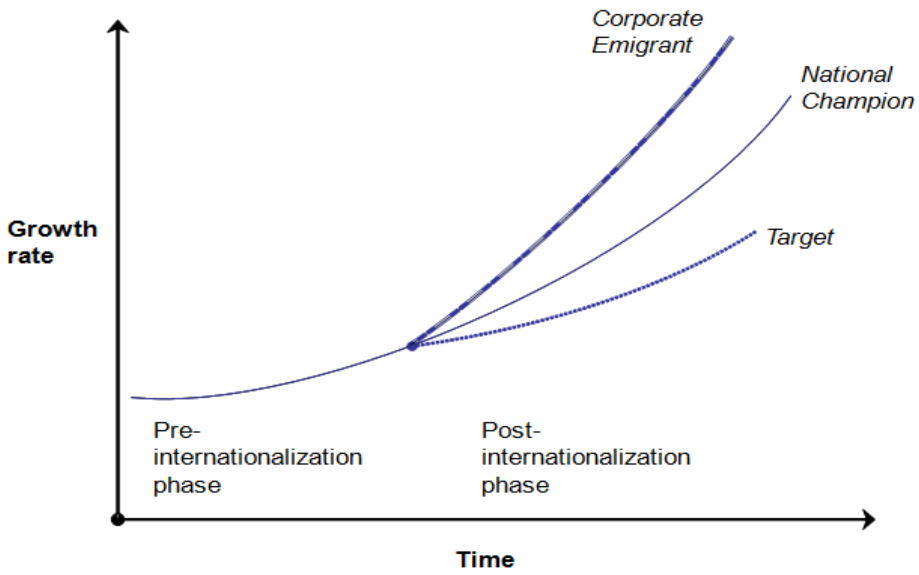

Figure 1. Expansion paths

1. Escape Investment seeks to avoid disadvantageous conditions in the home country. These conditions may be heavy taxation, lack of economic dynamism or the unacceptability of the business type in question. Thus, EMNE relocation to developed countries may be motivated by the desire to disengage from disadvantageous conditions at home.
2. Support Investment seeks to augment the capabilities or activities of the firm. Thus, EMNE relocation to developed countries may be motivated by the need to substantiate previous investment.
3. Passive Investment is akin to portfolio investing. Here, a minority stake may be purchased in an existing firm or asset and the emphasis is not necessarily on the management of the investee. This form of investment does not add to the understanding of EMNE relocation.

In the case of EMNEs, relocation may also be driven by managers pursuing their own, personal objectives, even if they are not well aligned with those of the organization. Such an “agency” problem may reflect individual desires to escape an unpleasant environment or to enjoy a better quality of life which may be available at home. The agency problem, however, could also work the other way and limit the organization’s mobility if key executives do not wish to leave the comforts of their home.

Location drivers and constraints

EMNEs have disrupted and heightened competitive markets, forcing incumbent, largely Western, MNEs to respond with product innovation, consolidation and reconfiguration of value chains (Guillén and García-Canal, 2009; Ramamurti, 2009). In doing so, EMNEs have become key actors in foreign direct investment and cross-border acquisitions. It is critical that their decisions obtain greater scrutiny. A comparison between traditional and MNEs and new EMNEs, is shown in Table 1 (Guillén and García-Canal, 2009).

Four general motivations for the foreign investment of MNEs are natural resource seeking, market seeking, efficiency seeking and strategic asset seeking (Dunning and Lundan, 2008). Natural resource seekers look for resources abundant to a region. These resources may be physical such as mineral deposits and are typically location-bound. Alternatively, there may be abundant human resources ina location, such as inexpensive labour or skills – technical, managerial or marketing. Corporate emigrants look for skilled human resources, for example in management or marketing, in their relocation decisions.

Market seekers invest to supply goods or services to markets that have been serviced previously by exports from the investing country (Dunning and Lundan, 2008). These firms may be following the relocation of production by suppliers or customers; which may need local adaption of their products; may be taking advantage of reduced transportation costs; or may be following a defensive or aggressive competitive strategy. Corporate emigrants may be motivated by the need to market more intensively to customers in those countries. Efficiency seekers aim to benefit from economies of scale and scope and of risk diversification (Dunning and Lundan, 2008). Corporate Emigrants' relocation to developed countries may be motivated by the need to rationalise previous investments in those countries, or to allocate corporate, rather than business unit level, activity to a

Table 1. A Comparison of "New" and "Traditional" multinational enterprise (MNEs)

Dimension	New EMNEs	Traditional MNEs
Speed of internationalisation	Accelerated	Gradual
Competitive advantages	Weak: Upgrading of resources required	Strong: Required resources available in-house
Political capabilities	Strong: Firms used to unstable political environments	Weak: Firms used to stable political environments
Expansion path	Dual path: Simultaneous entry into developed and developing countries	Simple path: From less to more distant countries
Default entry modes	External growth: Alliances and acquisitions	Internal growth: Wholly owned subsidiaries
Organisational adaptability	High, because of their meagre international presence	Low, because of their ingrained structure and culture

more suitable location.

Strategic asset seekers invest in line with a long term strategy, typically to secure long-term competitiveness. These investments seek to augment previous commitments and existing asset bases, or to exclude ownership advantages to other firms. These investments may not be strictly profitable in the sense required in the other investment motives described above (Dunning and Lundan, 2008). Corporate emigrants may be motivated by a belief that the new region will be increasingly significant in the future. As EMNEs' competitive advantages are "weak" and they need to upgrade their resources, EMNEs are motivated to acquire some of the same firm and country specific capabilities held by their more traditional competitors. If these advantages are concentrated in geographic areas and are freely available to all firms in that area, the firm will be motivated to relocate to a region rich in these assets.

If emerging markets are unsupportive of headquarters, and MNEs located in developed markets have location advantages, EMNEs will be motivated to relocate themselves. Such motivation assumes that any loss of country specific advantage from the home country will be recovered in the move, and that firms are sufficiently mature such that firm specific advantages, example, an "adversity advantage" (Ramamurti, 2009), are fully transportable. Firms that do not relocate, for whatever reason, carry the costs of their disadvantaged locations. If a firm does not relocate, and remains globally competitive, this implies that it possesses country or firm specific advantages of greater magnitude than the disadvantages that accrue from its headquarters location. The more disadvantaged a particular location, the more firms would be expected to relocate from that country. With economic growth, the rate of relocation should slow as the disparity reduces, assuming a global *status quo* in terms of capital and personal transportability.

Predating recent advances in communication and service technologies, location research until the 1990's was based on the presumption that management and production functions were co-located (Deschryvere, 2009). As such, no distinction was made between headquarters and production relocations. More recently, the corporate headquarters has been visualised as a collection of thee divisible functions: Financial, Legal and Managerial (Desai, 2009). Here, the processes and products are distinct for individual business units and production centres. Each of these functions has specific motivations for its location choice, as illustrated below. Due to reductions in communications and travel costs, "firms are redefining their homes by unbundling their headquarters functions and reallocating them opportunistically across nations. …and, consequently, the idea of firms as national actors rooted in their home countries is rapidly becoming outdated" (Desai, 2009: 409), as depicted in Figure 2 (below).

Given the role and needs of each of the three homes, different drivers for competitiveness push and pull EMNEs in their headquarters relocation decisions. Similarly, there are constraints on them that resist the drive to relocate.

Resource and efficiency seeking drivers

Given that the most basic input and product of the headquarters is information, the optimisation of information transfer is a key for competitiveness. Researching European and American headquarters relocations respectively, Bel and Fageda (2008) and Strauss-Kahn and Vives (2009) agree that transport infrastructure and the costs of tacit information exchanges are important for the location of headquarters of large companies. Headquarters also move in order to optimise value chain elements, particularly business services. Ono (2003) demonstrated the link between location and the inexpensive procurement of services such as advertising, accounting and legal services. In the United States, headquarters location decisions are largely driven by the presence of a large and varied local supply of business services rather than the presence of a large number of headquarters (Pennings and Sleuwaegen, 2000; Davis and Henderson, 2008;

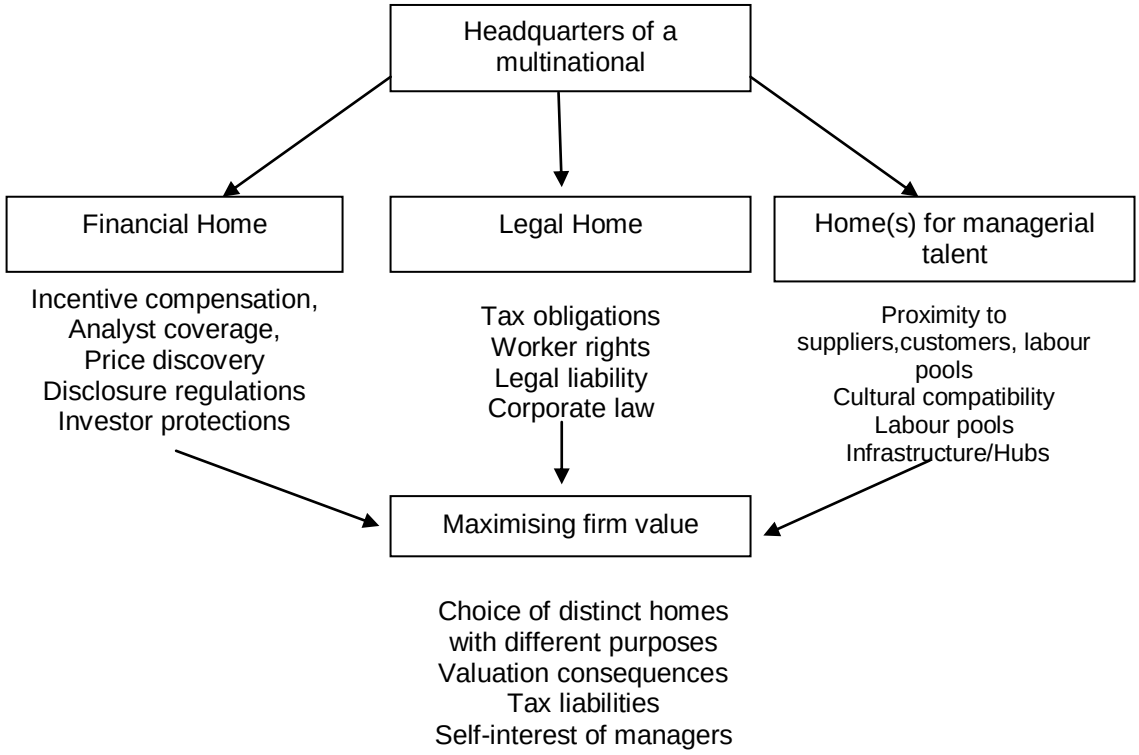

Figure 2. Reconceptualising the corporate home

Strauss-Kahn and Vives, 2009).

In reality, neither communication and transport connectedness nor the presence of a large and varied supply of business services are geographically universal. To remain competitive, the MNE must move to the location that offers the best advantages for both connectedness and value chain optimisation; the greater the relative disadvantage, the greater the motivation to relocate. Since part of the definition of an emerging market is a weakness in this support environment (FTSE Group, 2009), EMNEs would generally be more motivated to relocate abroad than firms from the developed world. If emerging markets have smaller pools of the skilled labour required for MNE corporate management, an impetus exists for EMNEs to relocate to the developed world in order to easily procure this resource.

Product and capital market seeking drivers

In Europe, Mucchielli and Saucier (1997) concluded that new product introduction is a cause of headquarters relocation. Many studies have shown that proximity to customers and the size of the product market in a host country are significant predictors of location choice (Head and Mayer, 2004; Pennings and Sleuwaegen, 2000; Strauss-Kahn and Vives, 2009). Birkinshaw,et al.(2006: 682) recognise that “it is now accepted that proximity to specialised labour, complementary suppliers and customers, and access to knowledge spillovers are all important benefits to the firm.”

Apart from proximity benefits, there may be an added marketing benefit or country-of-origin effect; that is, customers perceive the quality of a product as stemming from the company's location. Swiss watches are an obvious example. As emerging markets mature, they must overcome negative perceptions of their country of origin. For example, Toyota struggled in the 1960’s to establish the creditability of Japan as a centre of automobile production; a situation paralleled by Korean automobile manufacturers in the 1990's. MNEs based in developed economies would not feel this motivation as strongly.

A similar “legitimacy effect” has been noted in the case of investors. MNEs improve their visibility and relationships with shareholders and financial institutions in a progressive pattern (Birkinshaw et al., 2006). They may start with the issuance of foreign depositary receipts, continue through to overseas listings, and finally end in a relocation of the corporate office to a global financial centre. This progression has been promoted by EMNEs as a demonstration of their commitment to global capital markets. The reward may be in terms of borrowing costs, stock liquidity and the value of corporate governance. Other benefits include analyst coverage, price discovery, disclosure regulations and investor protection (Desai,

2009). The act of moving, as a signal to markets, may be more important than the benefits of the relocation itself (Birkinshaw et al., 2006).

MNEs list their securities in the developed world to access investor capital. For example, news corporation relocated from Australia to the United States in 2004 to access more readily American investors that might, better appreciate media companies (Desai, 2009). Corporate headquarters are moved to get closer to important external influencers, primarily shareholders and financial market players (Birkinshaw et al., 2006). For EMNEs, generally from less well-endowed capital markets, this offers an even more powerful draw.

In situations of merger or acquisition, where there is a major change of shareholding, relocation is necessary to regain proximity to influencers. It has been shown that headquarters are often relocated following an increase of overseas share ownership or following a merger or takeover (Brouwer et al., 2004; Strauss-Kahn and Vives, 2009). In most cases, the location of the acquirer is chosen as the location for the united firm (Baaij et al. 2004).

Financial markets with a better reputation and a reduced risk perception, can demand a greater premium for their shares. Thus, the relocation of primary listing to a capital market in a lower risk country will increase the perceived value of the company (Mohamed and Finnoff, 2005).

Institutional resource seeking drivers

Key institutional drivers of location are tax incentives and labour institutions (Brouwer et al., 2004; Birkinshaw, et al*.,* 2006; Strauss-Kahn and Vives (2009). Mooij and Ederveen (2001) found that 1% increase in host-country tax rate decreases foreign direct investment (FDI) in that country by 3.3%. Further, firm taxation has a marked impact on the choice of corporate location, in terms of both “push” and “pull” (Devereux and Maffini, 2006; Egger, 2009; Voget, 2008). In addition, the taxation of individual employees influences location choice, and does so increasingly as a firm internationalises (Braunerhjelm, 2004). Separate from the location of their corporate headquarters, firms have been found to relocate their nominal legal location away from the United States to escape taxation (Desai and Hines, 2002). Parent-country taxation is a predictor of the *pattern* of MNE expansion (Barrios et al., 2008).

The strength, and rigidity of the available labour pool is another important location factor (Birkinshaw et al., 2006). Labour market rigidity puts “a brake” on a host country’s attractiveness, even within OECD countries (Delbecque et al., 2008). A less frequently discussed location factor is the lobbying and institutional power of the home country government in the international arena. Governments negotiate advantageous terms for their indigenous firms and these become country specific advantages. “Tier-l bargaining between the governments of host and home countries occurs bilaterally or through multilateral institutions” (Ramamurti, 2001: 23). State bargaining power on behalf of national business, is labelled as tier-2 bargaining. Multilateral institutions may include such bodies as the World Bank, the international monetary fund (IMF) and the world trade organisation (WTO). These institutions write the macro-level rules on FDI that frame micro negotiations between the MNE and potential subsidiary host countries. Given that emerging market governments are seen to have less ”voice” in such institutions (U.S. Department of State, 2009), there exists a driver to secure this advantage through relocation.

MNEs may also be motivated to relocate based on greater protection under law, including intellectual property, which may be offered by the host country (Desai, 2009), since emerging markets have a mixed record in legal enforcement and transparency (Transparency International, 2009).

Agency constraints

Agency concerns regarding the actions of corporate managers have been widely discussed during the recent global financial crisis. The effects of personal, rather than corporate, requirements may determine location choice (Braunerhjelm, 2004). Dominant shareholders, for example, may affect the decision making process to their parochial ends. Birkinshaw et al*.* (2006), in a developed country context, found that "the more concentrated the ownership of the MNE (in terms of the percent shareholding of the largest shareholder), the lower the likelihood of corporate headquarters or business unit headquarters moving overseas”(p. 689).

In many emerging markets, fast-rising EMNEs have a large percentage of state ownership. Their governments may be motivated to preserve local jobs and resist relocation. It follows that the higher a firm’s state ownership, where the state is an important external influencer, the lower the likelihood of relocation of the headquarters abroad. Alternatively, a dominant private shareholder may push for relocation to a nation seen to be more desirable. Here, capital flight or “escape investment” may apply (Dunning and Lundan, 2008). In a merger or acquisition, relocation may result because of either the removal or the introduction of different shareholder interests. Similarly, where managers seek personal relocation to a country with a higher quality of life, a concentration in private shareholding may motivate relocation from emerging markets.

Firm constraints

Firms and industries vary in many ways, such as their level of technology, their stage in the industry life cycle, the extent of global product and process standardisation,

Table 2. Strength of location factors for corporate headquarters

Location Factor	Generalised Strength of Location Factor	
	Emerging Markets	Developed Markets
Supply factors		
1. Support infrastructure	Low	High
2. Headquarters service providers	Low	High
3. Headquarters labour	Low	High
Capital market factors		
1. Equity market endowment	Low	High
2. Country risk perception	Low	High
3. Cost of capital	Low	High
Institutional factors		
1. Incentives and taxation	Mixed	Mixed
2. Educational Institutions	Low	High
3. Law and IP protection	Low	High
4. "Tier-2" bargaining power	Low	High
Agency factors		
1. Quality of life for management	Low	High
2. Personal taxation for management	Mixed	Mixed
Net Result	Low	High

human capital requirements and capital demand. As such, some firms and activities appear better suited to emerging market production (Ramamurti, 2009). It does not follow, however, that companies are better suited to having their headquarters located in emerging markets by virtue of their industry. Trans nationality will be associated with relocation, either as a predictor, or as a motivation, for relocation.

A firm's revenues, assets or employment may be concentrated geographically, even if reach a global scale. In such cases, it makes little sense to relocate the headquarters outside of that region since doing so would result in an increase in distance related transaction costs. If production or sales are predominantly in one area, that may be the best place to be settled. For example, the Tata group's corporate headquarters is likely to remain in Mumbai for the foreseeable future. This may be due to the mature industries which still dominant the production of the diverse group, primarily steel and automobiles. Alternatively, this may be because of the dominance of the Indian market, or both reasons together (Tata Group, 2010).

Summary of drivers and constraints

Driving and constraining factors for MNE headquarters location selection are summarized in Table 2 below. The generalised strength of each factor in emerging versus developed markets is shown.

As shown, emerging markets are less advantageous locations for corporate headquarters. EMNEs are motivated to relocate to developed markets in order to seek out location advantages in a new country of residence. Location choice will be driven particularly by financial market considerations, that is, to the countries housing financial markets with the greatest capital endowment and best reputations.

EMNEs not only have more motivation to relocate, they also have a high rate of movement. While 6% of all sampled MNEs in one study relocated across national boundaries between 1997 and 2007, those from emerging markets had a relocation rate of 50% (Voget, 2008). Firm relocation within the United Sates was only 5% a year between 1996 and 2001 (Strauss-Kahnand Vives, 2009). If firms do not relocate, their decision may be explained by constraining agency effects, such as concentrated or state shareholding, or by a lack of relevance of international operations. Other agency problems, centred around management's desire for quality of life and low personal taxation, are national factors that may also constrain headquarter location choice (Desai, 2009). Based on the above, the following propositions may be advanced:

P1: Emerging markets offer less locational advantage than developed markets for EMNE headquarters.

Table 3. Concepts, variables and data sources for locational advantage

Concept	Variable and Definition	Data Source
Emerging and developed markets	Published list of categorisations (Details may be found in the Appendix, Table A1.)	FTSE Group
Support infrastructure	"Connectivity"	IMD World Competitiveness Yearbook
Supplier availability	"Banking and financial services"	IMD World Competitiveness Yearbook
Labour pool quality	"Competent senior managers"	IMD World Competitiveness Yearbook
Equity market endowment	"Stock market capitalisation"	IMD World Competitiveness Yearbook
Country risk reputation	"Investment risk"	IMD World Competitiveness Yearbook
Cost of capital	"Cost of capital"	IMD World Competitiveness Yearbook
Educational Institutions	"Management Education"	IMD World Competitiveness Yearbook
Protection under law	"Legal and regulatory framework" "Intellectual property rights"	IMD World Competitiveness Yearbook
"Tier-2 Bargaining" State power	Average of (a) voting power within the IFC (b) voting power within the IMF and (c) Total national trade	IFC (2010) IMF (2009) CIA World Fact Book (2009)
Quality of life	"Quality of life"	IMD World Competitiveness Yearbook
Personal taxation	"Real personal taxes"	IMD World Competitiveness Yearbook

P2: EMNEs relocate their headquarters to developed markets, not to other emerging markets.
P3: EMNE headquarters location choice may be predicted by a concentration of private shareholding, levels of state ownership and levels of foreign business interest.

METHODOLOGY

To investigate the relationships identified above, a study was conducted on firms from South Africa. Using a single emerging market has advantages, which it controls for home country differences. South Africa is a good context to examine relocation effects as the international expansion of firms was artificially suppressed until the early 1990s, due to international sanctions against the Apartheid regime. Since the transition in 1994, South African forms have moved aggressively into global markets, with many relocating their headquarters. In 1994, no South African firm was among the 50 largest transnational corporations from developing economies, ranked by foreign assets (UNCTAD, 1996). In 1997, there were three, and by 2001, there were five (UNCTAD, 1999; UNCTAD, 2003b).

South Africa has experienced dramatic political adjustments in the last decades as well as discord between government and business (Klein and Wöcke, 2009) with a flight of human and financial capital recorded (Mohamed and Finnoff, 2005). As a result, South African MNEs have been motivated to relocate their headquarters to more advantageous locations. There has also been notable internal debate in South Africa over the motivations of corporate relocation McNulty, 2010). Finally, reporting standards in South Africa are high, even against global standards, allowing for transparency of shareholding (World economic forum, 2010).

Data sources

Data obtained from the Johannesburg securities exchange (JSE) were supplemented by other databases: International institute for management development (IMD) world competitiveness yearbooks, international finance corporation (2010), IMF (2009), the Zephyr database of Bureau van Dijk, (2010), McGregor BFA (2010), JSE (2010) and FTSE Group (2010). For differences in locational advantage, the latest available data in the IMD database were used. All available scores were selected between 2000 and 2010 and aggregates were used for analysis. The variables used as proxies for the concepts to be investigated, as well as the data sources, are tabulated below. (Table 3.)
To investigate location choice, the latest available data in the McGregor and Zephyr databases were extracted. The variables used as proxies for the concepts to be investigated, as well as the data sources are tabulated below. (Table 4.)

The oldest historical data available were chosen to mitigate any changes that have occurred since relocation. 255 transactions were found to match the set criteria. Of these, only 109 transactions occurred between firms based in developed and emerging markets. For location prediction, the additional variables used as proxies for the concepts to be investigated, as well as the data sources are tabulated below. (Table 5.). The study frame included all 74 EMNEs cross-listed on the JSE and any other exchange over the period 2004 to 2010. Of these, only those registered before 2004 were selected for further analysis. The logic behind focusing only on cross-listed companies is that they have already moved to access a larger or different pool of capital and that relocation of their

Table 4. Concepts, variables and data sources for location choice

Concept	Variable and Definition	Data Source
Corporate Emigrant	Company with previous relocation of primary listing away from the JSE, mutually exclusive with other categories	McGregor database
Outside-In firm	Company with no productive operations in the country of primary listing, mutually exclusive with other categories	McGregor database
National Champion	Company with primary listing on the JSE and major productive operations in South Africa, mutually exclusive with other categories	McGregor database
Relocation	Cross-border merger or acquisition transaction between 2000 and 2010 where the deal resulted in existing shareholders and payment was in shares of the acquirer. Final stake between 50 and 100% of the target firm.	Zephyr database
Original location	Country of incorporation of target	Zephyr database
New location	Country of incorporation of acquiring firm	Zephyr database

Table 5. Concepts, variables and data sources for location predictors

Concept	Variable and Definition	Data Source
Direct state ownership	The average percentage share ownership held directly by the home government for all years in which data was available, weighted 60% to 2006.	McGregor database
Total state ownership	The average total percentage share ownership held directly or indirectly by the home government for all years in which data was available, weighted 60% to 2006.	McGregor database
Foreign interest	Assets Transnationality: ratio of foreign assets to total assets a) Sales Transnationality: ratio of foreign sales to total sales Averaged for all years in which data was available	McGregor database
Transformations on foreign interest	a) Maximum of either the Assets or Sales Transnationality values b) Minimum of either the Assets or Sales Transnationality values c) Average of the Assets and Sales Transnationality values	McGregor database

headquarters is unlikely to be attributable to purely capital concerns. Data on private shareholder concentration was not available due to deficiencies in the data sources. Shareholding data were available from 2006 onwards. Where shareholder or transnationality data were missing, the company was excluded from the analysis. A total of 61 firms were available for further examination, of which 10 are corporate emigrants, 20 are outside-in firms and 31 are national champions.

Results

Locational advantage (P1)

As a first step in examining relocation, it is necessary to verify that the locational factors for South Africa actually motivate firms to leave home. Mean scores for the various factors of locational advantage were compared across developed countries and emerging markets as a group as well as to South Africa in particular. An analysis of variance (ANOVA) was carried out; the Wilcoxon/ Kruskal-Wallis signed-rank, non-parametric test was used as the data were non-normally distributed. The results are summarised in Table 6 below.

As can be seen, “tier-2 bargaining” state power is 61% greater in developed markets, but the difference is statistically significant only at the $p < 0.10$ level. Real personal taxes are very similar for both groups of countries. All of the other variables show significantly higher scores for developed markets. The scores for South Africa’s “banking and financial service” and “real personal taxes” were 7.04 and 5.13 respectively, in both cases above the developed market mean score. For all other variables, the South African score was lower than the mean for developed markets, indicating that relocational pressures exist for South African EMNEs.

Table 6. Summary of results for locational Advantage (P1)

Variable	Mean for Developed Markets (Std Error)	Mean for Emerging Markets (Std Error)	ANOVA P-value	W/K-W Signed Rank Test, Chi-square P-value
Connectivity	8.19500 (0.20258)	6.83350 (0.23098)		***
Banking and financial services	6.90308 (0.21525)	5.66550 (0.24542)	***	
Competent senior managers	6.27923 (0.19118)	5.47350 (0.21797)		*
Stock market capitalisation	1255.53 (447.12)	265.26 (509.80)		**
Stock market capitalisationLOG	6.00038 (0.26280)	4.86513 (0.29964)	**	
Investment risk	89.0335 (1.7202)	57.2760 (1.9613)		***
Investment risk LOG	4.48551 (0.02742)	4.03158 (0.03126)		***
Cost of capital	6.15692 (0.21168)	4.19450 (0.24135)	***	
Management education	6.34038 (0.21645)	5.00850 (0.24679)	***	
Legal and regulatory framework	5.61923 (0.25534)	4.13750 (0.29113)	***	
Intellectual property rights	7.34808 (0.21101)	4.74450 (0.24059)	***	
Tier-2 Bargaining" State Power	2.39308 (0.52655)	0.93600 (0.60036)		†
Quality of life	8.07000 (0.23900)	4.65200 (0.27250)		***
Real personal taxes	4.68308 (0.25656)	4.79450 (0.29252)	n.s.	

† p< 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

An exploratory multivariate analysis of variance was conducted to compare the overall vector of means difference between developed and emerging markets. The results of this analysis are tabulated in table 7 below. As can be seen, the two country types are significantly different, with the mean score for developed countries being higher, providing empirical support for the proposition that emerging markets offer less locational

Table 7. Result of means test for one-way MANOVA

Country Type	Number	Mean (Std Error)	Prob>F
Developed	26	8.19500	***
		(0.20258)	
Emerging	20	6.83350	
		(0.23098)	

*** p< 0.001.

advantage than developed markets for MNE headquarters.

Location choices (P2)

The sample was then reviewed for known location choices. Those EMNEs that had made alternative location choices were catalogued as either corporate emigrants or outside-in firms. That is, those who had chosen to relocate corporate headquarters from South Africa or those who had chosen to place their headquarters in a country other than that of their major operations. Details of firms described as corporate emigrants and their destination of relocation are shown in the appendix (Table A2). All of the South African corporate emigrants chose to move to developed markets in either Europe or North America as would be expected from their locational advantages over other emerging markets.

Details of firms described as outside-in, with the locations of their primary listing and primary operations are shown in the appendix (Table A3). Following the methodology of the London stock exchange, country of operation was taken to be the most significant geographical location for revenues or assets. For firms not listed in London, country of operation was derived from publically available data such as annual reports and firm websites. All but one of the outside-in firms chose to locate their headquarters in a developed market, despite their primary operations being in an emerging market. The curious nature of these firms is demonstrated well in the example of inter-phase-slip algorithm (IPSA). Despite having almost all sales and assets vested in one plant in South Africa, as well as future prospects being in South Africa, their head office is located in London.

Location predictors (P3)

Having shown that locational advantages of developed markets exist, we now turn to the question of why some firms do not relocate. Details of firms described as national champions are shown in the appendix (Table A4). National champions are compared to corporate emigrants in terms of their state ownership and transnationality of assets and sales in Table 8.

As can be seen, state ownership measures were 41% and 51% higher for national champions versus corporate emigrants, but these are not statistically significant at a $p < 0.10$ level. All transnationality variables show significantly higher values for corporate emigrants.[2] Overall, our results provide empirical support for the proposition that EMNE headquarters location are constrained by ownership factors and encouraged by levels of foreign business interest.

Discussion

Based on the factors chosen, there is significant evidence that emerging markets offer less locational advantage than developed markets for EMNE headquarters. EMNE headquarters in developed markets:

1. Are better able to communicate across internal and external boundaries, improving performance;
2. Are better supported by the supplier network desired by a headquarters office;
3. Have greater access to competent senior managers, required for business growth;
4. Have access to greater pools of equity capital, required to fuel business growth;
5. Benefit from lower country risk perception with investors;
6. Have access to cheaper pools of capital, required to fuel business growth;
7. Have access to better educational support, required to inform business growth;
8. Have economical legal and regulatory support, required for competitiveness;
9. Have greater protection of intellectual property, required for innovation; and,
10. Support access to a better personal quality of life for managers; and.
11. Enjoy the benefits of greater weight in multi-lateral institutions.

All of the ten corporate emigrants in this study chose to move to developed markets in either Europe or North America. All but one of the twenty outside-in firms chose

[2]Similar results were obtained using a logistic regression analysis (not reported here).

Table 8. Summary of results for location predictors

Variable	Mean for Corporate Emigrants (Std Error)	Mean forNational Champions (Std Error)	W/K-W Signed Rank Test, Chi-square P-value
Direct State Ownership	6.16450 (2.6436)	8.66979 (1.5799)	n.s.
Total State Ownership	7.7110 (2.8294)	11.6227 (1.6909)	n.s.
Assets Transnationality	58.4640 (8.0970)	21.3386 (4.8389)	**
Sales Transnationality	65.2580 (9.3227)	32.1719 (5.6736)	**
Minimum of Sales or Assets TN	55.9010 (7.9646)	17.7254 (4.7597)	**
Maximum of Sales or Assets TN	67.8210 (8.8346)	35.2593 (5.2797)	**
Average of Sales and Assets TN	61.8620 (7.8512)	26.4900 (4.692((4.6920)	**

** p< 0.01

to relocate their headquarters to developed countries, choosing to bear higher distance-related transaction costs arising from their primary country of operation being in an emerging market. Both of these facts support an argument that developed markets offer greater locational advantages than emerging markets to EMNE headquarters.

South African MNEs that did not choose to relocate were constrained by low levels of foreign interest. There is some evidence, but not very clear, that they may also have been constrained by higher levels of state ownership. There was evidence that relocating firms had businesses that were significantly more transnational than those that did not. Transnationality was not correlated with state ownership.

Our finding that transnationality is associated with headquarters location choice appears to be at variance with that of Birkinshaw et al. (2006) who suggest that business unit, not corporate; headquarters relocate when there is a large portion of sales and manufacturing activities overseas. This apparent contradiction may be present if increasing transnationality follows relocation (McNulty, 2010); transnationality here was measured after relocation and thus is more likely to be a result than a cause of relocation. In addition, while having a somewhat transnational business is necessary before a firm considers relocation, it may not be the reason for relocation. An ambition for transnationality may be a motivation for the move in the first place.

As data for the concentration of private ownership were not available, it was not possible to compare these results with those of Birkinshaw et al. (2006) who found that concentrated private ownership was likely to constrain relocation. We suggest that their finding would not hold true in South Africa or other emerging markets given the agency effect implied in the lifestyle quality offered in developed markets.

Rugman and Verbeke (1992, 2001) show how firm specific advantages may emerge from multiple sources. These may be from the home country office, a foreign subsidiary or across a MNE's network. The relocation of the headquarters to a global financial centre may be one way in which advantages are developed. Those that accuse emerging market MNEs of a lack of patriotism or label relocation as capital flight should acknowledge the competitive necessity of firms seeking the same country specific advantages as their developed market rivals.

Conclusion

A model describing the internationalisation of EMNEs was developed, describing three possible trajectories. The "Corporate Emigrant" is conceptualised as a firm that relocates its headquarters to obtain location specific advantages, while business unit offices remain elsewhere.

The “national champion” is seen as a firm that does not relocate and bears the costs, or benefits, of this decision. The “target” is acquired by another MNE, which results in an effective transfer of headquarters functions. A further variation is the foreign “outside-in” firm. Here, a foreign firm locates its headquarters and operations separately – managing from “outside”, with operations “in” country.

There is significant evidence that emerging markets offer less locational advantage than developed markets (Appendix 1) to EMNEs. It is clear that South African multinational enterprises relocated to developed markets, not to other emerging markets. EMNEs that did not choose to relocate were constrained by low levels of foreign interest, but the state did not necessarily restrict or impose transnationality.

The results imply that if emerging market nations seek to remain attractive to EMNE headquarters and the high value-added employment that they offer, they have significant ground to cover to improve their attractiveness on the factors measured. Specifically, the factors that remain under the control of the host state, the institutional and agency factors, need to be focused upon. In 2010, the South African treasury recognised that “The current regulatory framework has tax and exchange control aspects which are inhibitive to international headquarter companies seeking to leverage South Africa’s infrastructure and skills base as a means of investing in the rest of the continent. ... headquarters companies will be allowed to raise and deploy capital offshore without exchange control approval” (National Treasury - South Africa, 2010). Measures like this are typical kind required to retain EMNE headquarters.

Given the complexity of the location decision, shareholders must be watchful that managers will not motivate a particular choice for personal reasons. It has been demonstrated that developed markets offer better “quality of life” but the lifestyle of managers should not be allowed to compromise firm competiveness.

Limitations and directions for future research

While presenting intriguing findings, this study has some limitations. The sample size was very small with only ten corporate emigrants, and substantiation of the consequences of the three growth paths is required. We assumed location is equivalent to the nation of primary stock market listing, which may be an over-simplification (Desai, 2009). Further, the analysis does not compare the factor strengths of the nations chosen or prioritise them. As it is often the case, the variables chosen may also not faithfully characterise the factors as experienced by all EMNEs, implying a possible representation error.

Regarding state power, it could be argued that the influence of each European country was under-represented, as, in terms of trade, the European Union (EU) is a single large block. For example, Luxembourg’s total trade is small, but through its alignment with the EU, its overall influence may be seen as large. We also recognize that it is often regions, not nations, which attract headquarters. It is the square mile in the City of London that attracts financial firms as much as it is the country of Great Britain. This question of geographical boundary needs to be addressed more directly in future research.

It is recommended that future research should be broadened to include more countries, especially given the reality that the rate of relocation from South Africa has been high in recent decades. Emerging markets are diverse, and the case of South Africa may not be representative. Corporate headquarters relocations may be predicted by levels of state ownership and levels of foreign business interest elsewhere. Verification of this would add greatly to the understanding of MNE internationalisation and the impact of an emerging market origin. If country level variation is so great that this pattern is not replicated, further nuance could be brought to the understanding of the rise of EMNEs. Finally, clarity is required on the direction of causality between transnationality and relocation.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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APPENDIX

Table A1. Country classification

Developed Markets	Emerging Markets
Australia	Argentina
Austria	Brazil
Belgium	Chile
Canada	China
Denmark	Colombia
Finland	Czech Republic
France	Hungary
Germany	India
Greece	Indonesia
Hong Kong	Malaysia
Ireland	Mexico
Israel	Peru
Italy	Philippines
Japan	Poland
Luxembourg	Russia
Netherlands	South Africa
New Zealand	Taiwan
Norway	Thailand
Portugal	Turkey
Singapore	Ukraine
South Korea	
Spain	
Sweden	
Switzerland	
United Kingdom	
United States	

Table A2. Location choices for corporate emigrants

Company Name	Current Primary Listing	Previous Primary Listing
Anglo American PLC	London Stock Exchange	JSE
BHP Billiton PLC	London Stock Exchange	JSE
Brait S.A	Luxembourg Stock Exchange	JSE
Dimension DataHoldings PLC	London Stock Exchange	JSE
Investec PLC	London Stock Exchange	JSE
Capital Shopping Centres Group PLC	London Stock Exchange	JSE
Mondi PLC	London Stock Exchange	JSE
Net 1 UEPS Technologies Inc	Nasdaq Stock Market	JSE
Old Mutual PLC	London Stock Exchange	JSE
Sabmiller PLC	London Stock Exchange	JSE

Note. Billiton was the first South African EMNE to relocate, in 1997. It merged with BHP in 2001 to form BHP Billiton. Brait was formed in 1998 following the merger of the banking interests of Capital Alliance Holdings, South Africa, and Tolux, Luxembourg. Brait is now headquartered in Luxembourg. The Capital Shopping Centres Group was formally known as Liberty International PLC.

Table A3. Location choices for outside-in firms

Company Name	Current Primary Listing	Country of Primary Operation
African Eagle Resources PLC	London Stock Exchange	Zambia
Anooraq Resources Corporation	Toronto Stock Exchange	South Africa
Aquarius Platinum Limited	Australian Stock Exchange	South Africa
BRC Diamondcore Limited	Toronto Stock Exchange	DRC
Central Rand Gold Limited	London Stock Exchange	South Africa
Coal of Africa Limited	Australian Stock Exchange	South Africa
Conafex Holdings SA	Luxembourg Stock Exchange	South Africa
Eastern Platinum Limited	Toronto Stock Exchange	South Africa
First Uranium Corporation	Toronto Stock Exchange	South Africa
Great Basin Gold Limited	Toronto Stock Exchange	South Africa
Halogen Holdings SA	Luxembourg Stock Exchange	South Africa
IPSA Group PLC	London Stock Exchange	South Africa
Lonmin PLC	London Stock Exchange	South Africa
Lonrho PLC	London Stock Exchange	Mozambique
Marshall Monteagle Holdings SA	Luxembourg Stock Exchange	South Africa
Pan African Resources PLC	London Stock Exchange	South Africa
Rockwell Diamonds Incorporated	Toronto Stock Exchange	South Africa
Tawana Resources NL	Australian Stock Exchange	South Africa
Uranium One Inc	Toronto Stock Exchange	South Africa
Zambia Copper Investments Limited	JSE Limited	Zambia

Table A4. National champions

National champions
African Oxygen Limited
African Rainbow Minerals Limited
Anglo Platinum Limited
Anglogold Ashanti Limited
Barloworld Limited
Datatec Limited
DRDGold Limited
FirstRand Limited
Gold Fields Limited
Harmony Gold Mining Company
Highveld Steel and Vanadium Corp
Impala Platinum Holdings Limited
Metorex Limited
Metropolitan Holdings Limited
Mutual & Federal Insurance Comp Ld
Nedbank Group Limited
NictusBeperk
Oceana Group Limited
Pretoria Portland Cement Company
Randgold& Exploration Company Ld
Sanlam Limited
Santam Limited
Sappi Limited
Sasol Limited
Shoprite Holdings Limited
Standard Bank Group Ltd
Telkom SA Limited
TongaatHulett Limited
Trans Hex Group Limited
Truworths International Limited

Table A4. Contd.

Woolworths Holdings Limited

Note. Following an acquisition, Highveld Steel and Vanadium is now known as Evraz Highveld Steel and Vanadium.

academicJournals

Vol. 8(8), pp. 270-282, 28 April, 2014
DOI: 10.5897/AJBM2014.7365
ISSN 1993-8233

http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

The next frontier: Open innovation and prospecting of knowledge in highly complex environments – Towards value creation in high tech Industries

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Received 27th January 2014; Accepted 9th April, 2014; Published 28 April 2014

This article aims to contribute to a policy of innovation management. To do so, it presents the influence practices of open innovation in the prospecting of knowledge for value creation in highly complex environments. The research was conducted in the light of theoretical excerpts and application of a survey to specialists, with knowledge about the investigated object, selected by scientific and technical criteria. The survey was addressed to high tech industries in Brazil. The data were extracted by means of a matrix of judgment in which experts made their judgments about the variables investigated. In order to reduce subjectivity in the results achieved, the following methods were used: multicriterial analysis, artificial neural networks and neurofuzzy technology. The produced results were satisfactory, validating the presented proposal.

Key words: Open innovation practices; prospecting of knowledge; high tech industries.

INTRODUCTION

Recently, relevant changes have made organizational boundaries more fluid and dynamic in response to the rapid pace of knowledge diffusion (Abrahamson, 1991; Griliches, 1990; Teece, 1986; Teece et al.,1997), innovation and international competition (Chesbrough and Rosenbloom, 2002; Christensen, 2003; Damanpour, 1996). This helps to reconsider how to succeed with innovation (Teece, 1986; Teece, Pisano, and Shuen, 1997), 1997; Wheelwright and Clark, 1992). Innovation events, such as the introduction of a new product or process, represents the end of a series of knowledge and the beginning of a value creation process that can result in improvement in business performance marked by the ability to counteract the vulnerability of the globalization of business. However, the ability to design and provide innovative products with great incremental value to customers in a specific issue requires technical expertise of different knowledge derived from internal and external sources of knowledge (Chesbrough, 2003). But it is also true that organizations need to properly use the knowledge derived from different sources and check the business status of their activities and therefore, innovations should be used as increments of the process of interaction of knowledge. Different innovations depend on different types and sources of knowledge. This way, it is believed that assessing the relative importance of the

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different sources of knowledge for the performance of innovation is relevant because it informs the companies in their strategic decisions about the development of different channels for knowledge acquisition (Frenz and Ietto--Gillies, 2009).

The sources of knowledge (P and D, Universities and research Centers among others) have multifaceted nature (Kline and Rosenberg, 1986; Von Hippel, 1988) and show different impacts on a company's business, since the innovation performance is strongly dependent on and boosted by knowledge and its respective sources (Frenz and Ietto--Gillies, 2009). With the widespread diffusion of knowledge, all the knowledge necessary for creating innovations is no longer present within the firm's boundaries. They need to acquire knowledge from other sources. In fact, knowledge expands the potential for creating business value (Roper et al., 2008). However, the capacity of prospecting of knowledge is a complex challenge. Several studies have referenced the importance of the collaboration from knowledge and innovation generation (Chesbrough, 2003). This takes to evaluate the influence of innovation practices, in particular open innovation in the prospecting of knowledge. Open innovation is a new way of thinking of innovation for firms, where firms explicitly cooperate with others to create new innovations (Chesbrough, 2003). Open innovation is a model that assumes that firms can and should use external as well as internal ideas and internal and external paths to market, as they look to advance their technology (Chesbrough, 2006). Open innovation can be thought of as systematically exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with the firm's capabilities and resources, and broadly exploiting those opportunities through multiple channels (West and Gallagher, 2006;Grotnes, 2009). Thus, this article aims to contribute to a policy of innovation management. To do so, it presents the influence of practices of open innovation in the prospecting of knowledge for value creation in highly complex environments. The article is divided according to the following sections: Methodology, verification of the conceptual model and subjacent analyzes, conclusions and implications.

DESIGNER OF RESEARCH

Conceptual model framework: Constructs and hypotheses

This section examines the conceptual model (Figure 1) and presents the hypotheses to be tested throughout this work. The open innovation paradigm (Chesbrough, 2003) can be characterized by its porous innovation process, and the strong interaction of the company with its environment. By integrating a large number of individuals into the innovation process, new creativity and know-how is brought into the organization (inbound open innovation). Von Hippel (1988) suggested using lead users and other stakeholders as external sources of innovation (Schroll and Mild, 2011). Not only can this attract more talent, it can also transfer idle innovative ideas and R&D technology externally to other companies. Enterprises use the concept of open innovation, in which internal innovative ideas can flow outward and external ideas and technologies can flow inward within an enterprise. Chesbrough (2003a) proposed the concept of open innovation which indicated that businesses should become more open to innovation processes and value creation. Value is generated by nurturing informal relations and encouraging a free, horizontal flow of knowledge across organizational boundaries by opening new channels of communication and sustaining propagation of new ideas (Grimaldi and Cricelli, 2012). In this perspective the knowledge has forced firms to ground their value creation. The open innovation approach explores knowledge acquired from external sources (competitors, universities and partners) (Grimaldi and Cricelli, 2012). Business exposure to internal and external knowledge promotes the generating value (St-Jean and Audet, 2012; Fosfuri and Tribo, 2008; Norman, 2004). In contexts where knowledge is a crucial asset, companies increase their dependency on external sources to improve firm performance (Morgan and Berthon, 2008). In this perspective, knowledge emerges as one of the most important strategic resources for the companies. To raise the capacity of value and innovation creation, the organizations must be able to create this value. Thus, from the theoretical excerpts, the following variables and hypotheses of this study were raised.

Independent Variables: From the findings in the literature (Lopes and Teixeira, 2009; Moreira et. al.2008) the following open innovation practices were identified (Trentini et.al., 2012):

Value Chain: The value chain of innovation is one of the most popular practices, because it increases significantly the incremental value of business. Chesbrough (2006) shows that open innovation assumes that useful knowledge is widely distributed and that even more capable of organizations of R&D should identify, connect and boost external sources of knowledge as an elementary process for innovation.

Product development through patent licensing: It is a very common practice. The occurrence of technology licensing has been mainly concentrated in the chemical industry - pharmaceutical, electrical and electronic equipment, computers and industrial machinery.

Partnerships for co-development: It is a practice that has become business models that enables increasing innovation reducing P&D costs and facilitates the expansion and dissemination of innovation.

***Relationship between companies and scientific and technological system*:** It is a practice that enables the research developed at universities and research centers supports the industrial requirements, allowing the specialization of each entity with return for both parties. Moreira et al. (2008) report some of the challenges to be overcome, such as: relationship difficulties, lack of communication, divergent goals and visions, deadline mismatches, the distribution model of knowledge in universities that hinders the identification of researchers and research made, and the steps of assessment and valuation of technologies.

Spin-offs* are companies created to develop opportunities generated by the parent company*: They aim to explore new business conditions in order to minimize negative impacts on the parent company. In this kind of practice, projects that do not have any internal interest may generate new business.

Mergers and acquisitions: Mergers and acquisitions are aimed at absorbing knowledge and external technology, allowing a faster establishment in new markets and impeding the entry of new

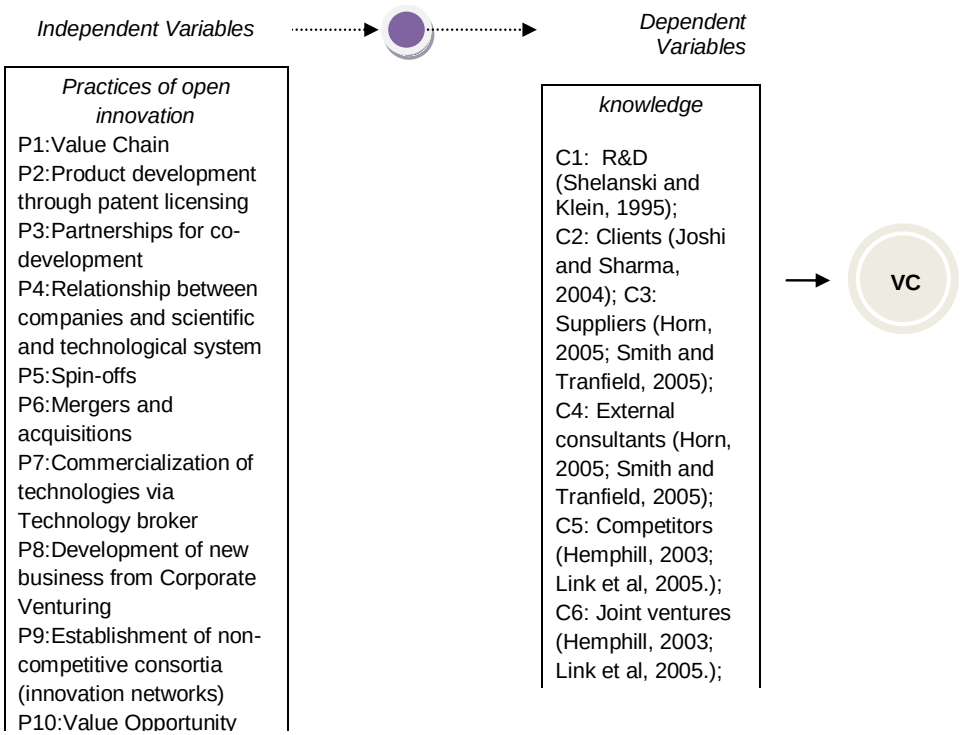

Figure 1. Conceptual model

competitors, as well as reducing costs and increasing the possibility of releases.

***Commercialization of technologies via Technology broker*:** It is a practice of open innovation in which a professional assists in finding, rating, marketing and managing the transfer of certain technology / knowledge through a network of contacts.

***Development of new business from Corporate Venturing*:** It is a form of investment in which companies invest capital in new-born businesses with innovations that may or may not be related to the business and have a high level of risk, but with great potential for growth.

Establishment of non-competitive consortia (innovation networks): It is a collaborative practice in which P&D companies associate with universities, research centers or competing companies with the goal of generating knowledge and products that would hardly be possible in an individual way.

V*alue opportunity web – VOW:* Is a practice of capturing and analyzing potentially valuable data on the external environment and transforming that information into winning products for consumers. The goal of a VOW is to analyze the data obtained taking into account new needs, new ways of doing things, new product features and new models the company may deliver value to the customer.

Dependent Variables: The independent variables were extracted from the specialized literature and assessed by experts for confirmation. The following independent variables were identified: Stakeholders' knowledge: C1: R&D (Shelanski and Klein, 1995); C2: Customers (Joshi and Sharma, 2004); C3: Suppliers (Horn, 2005; Smith and Tranfield, 2005); C4: External consultants (Horn, 2005; Smith and Tranfield, 2005); C5: Competitors (Hemphill, 2003; Link et al, 2005); C6: Joint ventures (Hemphill, 2003; Link et al, 2005.); and C7: universities/other public research centers (Ropper et al., 2004). For the Customer dimension, the construction used is based on Joshi and Silva (2004); Sansão and Terziovski (1999). For the suppliers variable (Horn, 2005; Smith and Tranfield, 2005), the content was derived from the construction used by Dow et al. (1999) and Forza and Filippini (1998). For the R&D variable, the construct was mainly derived from Shelanski and Klein (1995); GUPTA, Wilemon, and Atuahene-Gima (2000) and Chiesa et al. (1996), which capture two important R&D aspects: capabilities and connections. As for the variable external consultants, the construct is based on Horn (2005); Smith and Ranfield (2005). The variable competitors is based on Hemphill (2003); Link et al (2005).

Finally, the variable joint venture is based on Hemphill (2003) and Link et al (2005). From the conceptual model, the following hypotheses were made: Hipothesis - *H1*: The practices of open innovation influence to a greater or lesser degree the prospecting of knowledge for value creation in highly complex environments. *H2*: The optimal rate of value creation depends on the combination and interaction of the influence of the practices of open innovation in the prospecting of knowledge in highly complex environments.

RESEARCH DESIGN

Scope of the study

The Brazilian high-tech companies are very sensitive to technology advancement and demonstrate high innovation growth. These are industries characterized by high intensive capital, highly technical level and complex production process, short life cycle and high R&D investments. These companies require robust and

efficient tools to support their decisions.

Sample and data collection

This research treated Brazil's high-tech industries as the empirical targets. The researcher selected the more well-known firms. The data collection was performed using a scale/matrix assessment questionnaire. The technique used was the stated preference, taking into account that these methods work with the preferences of the decision makers, revealed by the choice made among the alternatives selected from a set of real alternatives, or not. In this classification framework, the research interviews and consultations with the experts are highlighted. With this procedure, the information collected can be set apart in different parts by adjusting the phases and steps of the model. A survey was conducted with 20 experts, selected according to their technical-scientific criteria. The researcher regarded the new product project managers, knowledge managers, experienced product planning personnel, innovation managers, organizational managers, R&D managers, technology managers, planning, technological innovation and modeling managers. The targeted respondents of the survey were senior product development managers, vice presidents and directors. They were requested to fill out the questionnaire, follow-up phone interviews. The questionnaire respondents should have complete understanding towards the innovation product development. Cury (1999) recommends a sample of twenty to thirty experts. Next, these procedures were detailed, which contributed significantly to the analysis of the results achieved in each phase and step of the modeling.

Conceptual model verification and underlying analyses

To solve the research problem and achieve the desired goal, the practices of open innovation of the high tech industries were identified and then evaluated according to their influence on the prospecting of knowledge according to the respective sources of knowledge. Finally, the optimal rate of value is modeled from the interaction between all dependent variables.

Phase 1: Modeling influence of the open innovation practices in the prospecting of knowledge of the actors (sources)

This phase is systematized in the following steps:

Step 1*) Identification practices of open innovation:* Thus, the following practices of open innovation from the specialized literature were identified and confirmed by experts: Value Chain; product development through patent licensing; partnerships for co-development; relationship between companies and scientific and technological system; Spin-offs; mergers and acquisitions; commercialization of technologies via technology broker; development of new business from corporate venturing; establishment of non-competitive consortia (innovation networks); and VOW.

Step 2) *Identification of the sources of knowledge and their respective knowledge:* The identification is systematized in the following: C1: R&D (Shelanski and Klein, 1995); C2: Clients (Joshi and Sharma, 2004); C3: Suppliers (Horn, 2005; Smith and Tranfield, 2005); C4: External consultants (Horn, 2005; Smith and Tranfield, 2005); C5: Competitors (Hemphill, 2003; Link et al, 2005.); C6: Joint ventures (Hemphill, 2003; Link et al, 2005.); and C7: universities/other public research centers (Roper et al., 2004).

Step 3) *Evaluation influence practices of open innovation in the prospecting of knowledge in high tech industries:* This procedure was developed using the multi-criteria analysis electre III, promethee II e compromise programming and artificial neural network (ANN). Next, these procedures were detailed. The methods used were compromise programming, electre III and promethee II. The results achieved confirm Hypothesis 1:

The practices of open innovation influence to a greater or lesser degree the prospecting knowledge of the actors, and assigning values to each criterion, we arrive at a matrix of criteria x alternatives that together with the vector weights provides the necessary support to apply the multicriteria methods.

In other words, one applies the selection and classification methodology of alternatives, using the compromise programming, promethee II and electre III methods. The compromise programming due to its wide diffusion and application simplicity and understanding renders it an alternative to evaluate problems as referenced in this application. The problem solution compromise is the one that comes closest to the alternative. This method was designed to identify the closest solution to an ideal one. Therefore, it is not feasible using a predetermined pattern of distances. In promethee II there is a function of preferences for each criterion among the alternatives which must be maximized, indicating the intensity of an alternative to the other one, with the value ranging from 0 to 1. Of the electre family (I,II,III,IV and V), electre III is the one considered for the cases of uncertainty and inaccuracy to evaluate the alternatives in the decision problem. All these methods enable to analyze the discrete solution alternatives, and taking into consideration subjective evaluations represented by numerical scores and weights. As these are problems involving subjective aspects, the methods that best fit the

Table 1. Assessment of preferences – Influence of practices of open innovation in the prospecting of knowledge for value creation in highly complex environments

Practices of open innovation	Classification		
	Promethee II	Compromise Programming	Electre III
Value Chain / Partnerships for co-development	1ª	1ª	1ª
Product development through patent licensing	2ª	2ª	3ª
Relationship between companies and scientific and technological system	3ª	3ª	2ª
Value Opportunity Web – VOW / Spin-offs Commercialization of technologies via Technology broker	4ª	4ª	2ª
Development of new business from Corporate Venturing	3ª	4ª	3ª
Mergers and acquisitions / Establishment of non-competitive consortia (innovation networks)	3ª	4ª	4ª

situation of this research are the methods of the family electre and promethee. It should be mentioned that although the compromise programming method is not part of this classification, it has similar characteristics, showing much simplicity in order to understand its operation, which makes it feasible for this application. Within this pers-pective, the multicriteria methods are viable instruments to measure the performance practices of open innovation in the prospecting knowledge for value creation in the high tech enterprises. The results produced by this prioritization enable managers to better focus their efforts and resources on managing the practices of open inno-vation that perform best, which results in achieving the goals sought by the companies.

The structure of this prioritization (classification by hierarchical analysis) is proposed at three planning levels in a judgment matrix, in which at the first hierarchical structure level it defines the goal, which is to achieve the value creation of the companies that will feed the system; the criteria are in the second level, which are the knowledge (prospecting) of actors: K1: R&D (Shelanski and Klein, 1995); K2: Clients (Joshi and Sharma, 2004); K3: Suppliers (Horn, 2005; Smith and Tranfield, 2005); K4: External consultants (Horn, 2005; Smith and Tranfield, 2005); K5: Competitors (Hemphill, 2003; Link et al, 2005.); K6: Joint ventures (Hemphill, 2003; Link et al, 2005.); and K7: universities/other public research centers (Roper et al., 2004). The practices of open innovation of the companies are in the third level, the alternatives, which are: P1: Value Chain; P2 Product development through patent licensing; P3: Partnerships for co-development; P4: Relationship between companies and scientific and technological system; P5: Spin-offs; P6: Mergers and acquisitions; P7: Commercialization of technologies via Technology broker; P8: Development of new business from Corporate Venturing; P9: Establishment of non-competitive consortia (innovation networks); and P10: Value Oppor-tunity Web – VOW. The prioritization process obeys the judgment of the evaluators (experts). With the results of the judgment matrix, the methods were applied: *Promethee II, Electre III and Compromise Programming* to evaluate the innovation capacities in relation to the performance of the companies. Table 1 shows the results produced.

Table 1: Assessment of preferences – Influence of practices of open innovation in the prospecting of knowledge for value creation in highly complex environments

Open innovation networks introduce highly complex and multifaceted inter-organizational relationships (Jarvenpaa and Wernik, 2011). The results produced by the methods demonstrate the value chain and Partnerships practices of open innovation as the most significant ones to ensure the knowledge prospecting and value creation for the companies. In fact, value chain provides enterprises with the opportunity to identify their core competencies and position themselves in the marketplace according to their competitive abilities (Al-Mudimigh et al., 2004). Once value chains are composed, all partners hold a definite vision of the coherence within the industry value system to become a collaborative value chain. All members of a given value chain must work together to respond to the changes of market demands rapidly (Chiang and Trappey, 2006). Organizations create values for themselves and their customers via executing primary and supporting tasks. In the 1980s, value creation mainly depended on cost reduction and industry automation, but modern companies focus on value chain integration to achieve time-to-market and to enhance customer satisfaction (Garetti et al., 2005; Chiang and Trappey, 2006).

Thus, the value chain concept offers management a means by which they can evaluate both existing and new strategic opportunities to create customer and partner value (Walters and Rainbird, 2007). Essentially the value creation system is an analytical tool; it facilitates the identification and evaluation of strategic alternatives (Walters and Rainbird, 2007). Value chain analysis identifies the flow of added value through the value creation processes within both the industry and the firm. In the business model of the future, value chains compete

rather than individual companies, and the connectivity and process excellence are key challenges (AeIGT: 2003 cited in Johns et al. (2005). In addition, the cooperation in the value chain requires a complex repertoire of behaviors in that member's organizations need to learn to mitigate the risks stemming from the other's opportunism but also to avoid lapses in their respective knowledge-sharing (Jarvenpaa and Wernik, 2011). Increasingly, it has been argued that, innovative capacity is dependent upon building linkages through collaborative relationships (Coombs et al., 1996) […] this enables learning which adds to an organization's existing knowledge base and the creation of completely new knowledge (Inkpen, 1996) and also contributes to "novelty and variety in the economic system" by creating "new economic resources which otherwise simply would not exist" (Coombes et al., 1996). Such collaboration might involve sub-contracting, strategic alliances or joint ventures […] (McLoughlin, 1999; Walters and Rainbird, 2007). Partnership/ cooperative innovation combines elements of process innovation management and product innovation management within a network structure that neither partner can create using its own resources to meet customer/market determined expectations for product and/or service performance at an economic (viable) cost. Thus, the value chain concept offers management a means by which they can evaluate both existing and new strategic opportunities to create customer and partner value. Essentially the value creation system is an analytical tool; it facilitates the identification and evaluation of strategic alternatives (Walters and Rainbird, 2007).

When comparing the results in terms of performance, the compromise programming and promethee II methods did not differ in their classifications. For electre III, the results were incompatible. And this is because the p, q and v veto thresholds, respectively, of indifference, strong preference and veto or incomparability have a discrepancy in the structure of their results (classification). Electre III presents a set of solutions with a more flexible hierarchical structure. This is due to the conception of the method, as well as the quite explicit consideration of the indifference and incomparability aspect between the alternatives. The results referenced by the promethee II and compromise programming methods reflect the preference, according to the experts, for value chain and partnerships. The essence of the practices of open innovation is the accumulation of know-ledge over time. Next, is the influence practice of an open innovation in the knowledge prospecting. For this ANN was used. The technique adapts to the case in question.

Prospecting of knowledge using the artificial neural networks – ANN

The artificial neural networks - ANN is understood to simulate the behavior of the human brain through a number of interconnected neurons. A neuron executes weighed additions for the activations of the neurons representing nonlinear relations. The ANN has the capacity to recognize and to classify standards by means of processes of learning and training. The training of the net is the phase most important for the success of the applications in neural network. The topology of the net can be better determined by subjective form, from a principle that consists of adopting the lesser intermediate number of possible layer and neurons, without compromising the precision. Thus, in this application, the layer of the entrance data possess 10 neurons corresponding the 10 variable referring to practices of open innovation.

The intermediate layer possesses 8 neurons, and the exit layer possesses 1 corresponding neuron in a scale value determined for the ANN. The process of learning supervised based in the back propagation algorithm applying software easy NN determines the weights between the layers of entrance and intermediate, and between the intermediate and exit automatically. The training process was finished when the weights between the connections had allowed minimizing the error of learning. For this, it was necessary to identify which configuration that would present the best resulted varying the taxes of learning and moment. After diverse configurations have been tested, the net of that presented better resulted with tax of an equal learning 0,40 and equal moment 0,90. The data had been divided into two groups, where each period of training one third of the data is used for training of net and the remain is applied for verification of the results. The net was trained for attainment of two results' group for comparison of the best-determined scale for the networks.

In the first test the total judgment of the agents was adopted, however only as the test got better scales, which was next represented method of the multi-criteria analysis. With this, the last stage of the modeling in ANN consisted of testing the data of sequential entrance or random form, this process presented resulted more satisfactory. The reached results had revealed satisfactory, emphasizing the subjective importance of scale's methods to treat questions that involve high degree of subjectivity and complexity. How much to the topologies of used networks, the results gotten of some configurations of the ANN and compared with the multicriteria analysis, were observed that ANN 1, is the one that is better, if approached to the classification gotten for the multi-criteria analysis. Thus, even other topologies do not Tenaha been the best ones, it had been known however close in some practices of open innovation of the multi-criteria analysis. The results can be observed in Table 2 that follows.

In fact, the goal knowledge is to create value from organizational and individual knowledge. The benefits derived from good knowledge are multiple, and include: reduced duplication of effort, creation of new knowledge,

Table 2. Classification practices of open innovation using artificial neural networks and multicriteria analyis Methods

	Promethee II	Multicriteria analysis Compromise programinng	Electre III	ANN RNA
Value Chain / Partnerships for co-development	1[a]	1[a]	1[a]	1[a]
Product development through patent licensing	2[a]	2[a]	3[a]	2[a]
Relationship between companies and scientific and technological system	3[a]	3[a]	2[a]	2[a]
Value Opportunity Web – VOW / Spin-offs				
Commercialization of technologies via Technology broker	4[a]	4[a]	2[a]	3[a]

and increased efficiency and productivity. knowledge and innovation are the building blocks of sustainable competitive advantage (Porter, 1985), and therefore they are source for sustainable development and growth for enterprises. Thus, an innovation is the use of innovative knowledge so as to create effective value for the stakeholders in the value chain. From the perception of the innovation, the innovation value chain may be represented differently. Indeed, innovation starts from an idea that is often embedded with an innovative knowledge, to become somehow a prototypical invention, to finally become an innovative product or piece of technology that is industrially exploited or even commercialized. Porter (1985) argues that firms that optimize their value chain activities vis-a-vis competition stand a better chance of leveraging valuable capabilities into sustainable competitive advantage (Prajogo et al., 2008). Clearly any partnership innovation must be beneficial to all parties (Walters and Rainbird, 2007).

The results produced in the light of artificial neural networks confirm value chain and partnerships as the practice of open innovation that shows the most (in greatest degree) influence in the prospecting of knowledge. The value chain is supported by a particular value that creates a logic and its application results in particular strategic postures. Adopting a network perspective, a new economic value is configured to the organizations. Traditionally, value chain has been used as a concept and a tool to understand the analysis of industries and proved to be a useful mechanism for portraying the threaded engagement of traditional activities in industries (Porter, 1980). Moreover, it also shaped the thinking about value and value creation. The value chain of a company relates to other chains and knowledge coming from different sources (suppliers, competitors, channels and customers, among others), which then become a value chain of the industry. At the same time, a company can make analyzes of the links in the value chain between its suppliers, manufacturers and customers chain in order to find ways to increase the competition. For the concept of value network, value is co-created by a combination of actors in the network. Business networks are independent. After all, how is value created? A traditional answer to this question is simply the value chain. In this perspective, the knowledge is certainly one of the best resources and the only sustainable competitive advantage.

Phase 2: Modeling of the optimal effectiveness rate of value creation in the light of the influence of the practices of open innovation in the prospecting of knowledge of the actors

This phase focuses on determining the optimal efficiency rate (OERVC) for value creation in the high-tech companies using Neurofuzzy modeling. It is a process whose attributes usually possess high subjectivity characteristics, in which the experience of the decision maker is very significant. Thus, within this spectrum there is the need for a tool that allows adding quantitative and qualitative variables that converge towards a single evaluation parameter (Cury and Oliveira; 1999; von Altrock, 1997). This model combines the neural networks and logic fuzzy technology (neurofuzzy technology).

Here this model supports the planning practices of open innovation on the knowledge and value creation of high-tech companies, as it allows evaluating the desirable rate toward the acceptable performance of high-tech companies. The model shown here uses the model of Cury and Oliveira (1999). Based on the Neurofuzzy technology, the qualitative input data are grouped to determine the comparison parameters between the alternatives. The technique is structured by combining all attributes (qualitative and quantitative variables) in inference blocks (IB) that use fuzzy-based rules and linguistic expressions, so that the preference for each alternative priority decision of the optimal rate of value creation determinants, in terms of benefits to the company, can be expressed by a range varying from 0 to 10. The model consists of qualitative and quantitative variables, based on information from the experts. The Neurofuzzy model is described below.

Determination of input variables (IV): This section focuses on determining the qualitative and quantitative input variables (IV). These variables were extracted (10 variables: Value Chain; product development through patent licensing; partnerships for co-development;

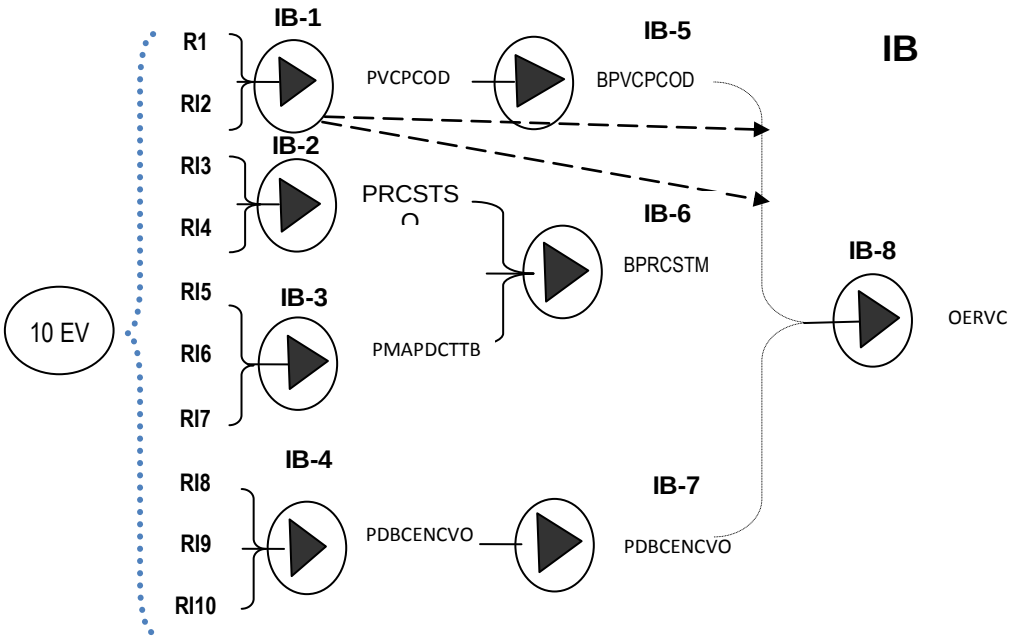

Figure 2. Neurofuzzy model

relationship between companies, scientific and technological system; spin-offs; mergers and acquisitions; commercialization of technologies via technology broker; development of new business from corporate venturing; establishment of non-competitive consortia (innovation networks); and VOW from the independent variables (dimensions of results Influence of practices of open innovation in the prospecting of knowledge for value creation in highly complex environ-ments. The linguistic terms assigned to each IV are: High, medium and low.

Accordingly, Table 1 shows the IVs in the model, which are transformed into linguistic variables with their respective degrees of conviction or certainty (DoC), with the assistance of twenty judges opining in the process. The degrees attributed by the judges are converted into linguistic expressions with their respective DoCs, based on fuzzy sets and IT rules (aggregation rules), next (composition rules). Figure 2 shows the Neurofuzzy model.

Determination of intermediate variables and linguistic terms: The qualitative input variables go through the inference fuzzy process, resulting in linguistic terms of intermediate variables (IVar). Thus, the linguistic terms assigned to IVar are: Low, medium and high. The intermediate variables were obtained from: Performance of the value chain and partnerships for co-development: PVCPCOD; performance of relationship between companies and scientific and technological system and Spin-offs: PRCSTSO: Performance of mergers and acquisitions, product development through patent licensing and commercialization of technologies via technology broker: PMAPDCTTB; performance development of new business from corporate venturing, esta-blishment of non-competitive: DNBENC consortia (innovation networks); and performance of VOW): PDBCENCVO. The architecture proposed is composed of eight expert fuzzy system configurations, fourqualitative input variables that go through the *fuzzy* process and through the inference block, thus producing an output variable (OV), called intermediate variable (IVar).

Then, the IVars, which join the other IVar variables form a set of new IVars, thereby configuring a sequence until the last layer in the network. In the last layer of the network the OV of the Neurofuzzy network is defined. This OV is then subjected to a defuzzification process to achieve the final result:

Optimal efficiency rate of value creation of high-tech companies. In summary, the fuzzy inference occurs from the base-rules, generating the linguistic vector of the OV, obtained through the aggregation and composition steps. For example, when the experts' opinion was requested on the optimal efficiency rate for the technological innovation capacity performance of company A, the response was 8.0. Then the fuzzification (simulation) process was carried out, assigning low, medium and high linguistic terms to the assessment degrees at a 1 to 10 scale. Degree 8, considered low by 0% of the experts, medium by 55% and high by 45% of the experts. In summary, the expert's response enabled to determine the degree certainty of the linguistic terms of each of the input variables using the fuzzy sets. The results confirm the *H2:* The optimal efficiency rate depends on the combination and interaction of the innovation capacities of the high-tech

companies. The generic fuzzy sets were defined for all qualitative IVars, which always exhibit three levels of linguistic terms: a lower, a medium and a higher one.

After converting all IVars into its corresponding linguistic variables with their respective DoC, the fuzzy inference blocks (IB), composed of IF-THEN rules, are operated based on the MAX-MIN operators, obtaining a linguistic value for each intermediate variable and output variable of the model, with the linguistic terms previously defined by the judges. With the input variables (features extracted from product development projects), the rules are generated. Every rule has an individual weighting factor, called certainty factor (CF), between 0 and 1, which indicates the degree importance of each rule in the fuzzy rule-base. And the fuzzy inference occurs from the rule-base, generating the linguistic vector of OV, obtained through the aggregation and composition steps.

Determination of output variable – optimal efficiency rate of value creation

The OV of the neurofuzzy model proposed was called optimal efficiency rate of value creation in high-tech companies. The fuzzification process determines the pertinence functions for each input variable. If the input data values are accurate, results from measurements or observations, it is necessary to structure the fuzzy sets for the input variables, which is the fuzzification process. If the input variables are obtained in linguistic values, the fuzzification process is not necessary. A fuzzy set A in a universe X, is a set of ordered pairs represented by Equation 1.

$$A=\{(\mu_A(x),x)|x \in X\} \quad (1)$$

Where (x) is the pertinence function (or degree of pertinence) of x in A and is defined as the mapping of X in the closed interval [0.1], according to Equation 2 (PEDRYCZ and GOMIDE, 1998).

$$\mu_A(x):X \rightarrow [0.1] \quad (2)$$

Fuzzy Inference: The fuzzy inference rule-base consists of IF-THEN rules, which are responsible for aggregating the input variables and generating the output variables in linguistic terms, with their respective pertinence functions. According to Von Altrock (1997), a weighting factor is assigned to each rule that reflects their importance in the rule-base. This coefficient is called certainty factor (CF), and can vary in range [0,1] and is multiplied by the result of the aggregation (IT part of inference). The fuzzy inference is structured by two components: (i) aggregation, that is, computing the IF rules part; and (ii) composition, the THEN part of the rules. The Degree of Certainty (DoC) that determines the vectors resulting from the linguistic processes of aggregation and composition are defined with Equation 3.

$$DoC_i:max[FC_1 \ . \ min\{GdC_{A11},GdC_{A12},...,GdC_{1n}\},...,FCn \ . \ min\{GdC_{An1},GdC_{An2},...,GdC_{Amn}\}| \quad (3)$$

Defuzzification: For the applications involving qualitative variables, as is the case in question, a numerical value is required as a result of the system, called defuzzification. Thus, after the fuzzy inference, fuzzification is necessary, that is, transform linguistic values into numerical values, from their pertinence functions (Von Altrock, 1997). The IT maximum center method was popularized to determine an accurate value for the linguistic vector of OV. Based on this method, the degree of certainty of linguistic terms is defined as "weights" associated with each of these values. The exact value of commitment (VC) is determined by considering the weights with respect to the typical values (maximum values of the pertinence functions), according to Equation 4 presented below (Von Altrock, 1997; Cury and Oliveira, 1999).

$$OV = \frac{\sum_{i=1}^{n} DoC_i \, . \, X_i}{\sum_{i=1}^{n} DoC_i \, . \, X_i} \quad (4)$$

Where i DoC represents the degrees of certainty of the linguistic terms of the final output variable and i X indicates the end of the typical values for the linguistic terms, which correspond to the maxima of fuzzy sets that define the final output variable. By way of demonstration, using assigned IT (average) hypothetical (Company A) enters-IT into the calculation expression of TPCITj with GdCi of the following linguistic vector of the output variable, also hypothetical: LOW=0.20, MIDDLE=0.53, HIGH=0.17. The numerical value of OERVC at a 0 to 1 scale corresponds to 0.9417, resulting from the arithmetic mean of the values resulting from the defuzzification of each of the simulated twenty judges. This value corresponds to an average value for OERP. With this result (optimal efficiency rate: 0.9417) produced for a better combination and interaction of strategic practices of open innovation that converged toward a single parameter, it is feasible to assert that this combination of technological innovation activities of the firm at this time, can at least ensure the performance desired by the firm at that time. It is plausible that the company maintains at least this value (0.9417), which ensures the desired performance. It is also plausible to state that, to some degree, there is efficiency in the management of those planning innovation in this category of companies. To illustrate this, assuming that the study-object companies demonstrate the following optimal efficiency rates for value creation of compnies: A – 0.8892; B-0.5149; C-0.6628; D-0.3871;

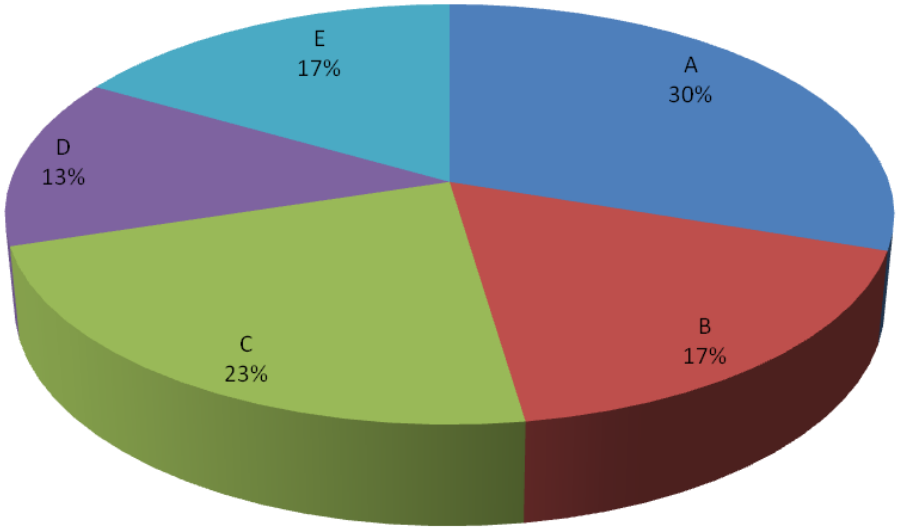

Figure 3. Optimal efficiency rate of value creation

AND-0.4921. The expected reference for value creation for all firms is 0.6827 (hypothetical) (Figure 3). It is concluded that:

Company A show efficiency in the combination of their practices of open innovation, based on the prospecting of knowledge and value creation. The priorities practices of open innovation for value creation are dynamic and dependent on constraints and uncertainties that come from the environment at any given time. Companies B, C, D and E are not efficient in combining their strategies practices of open innovation for prospecting knowledge and value creation, since they do not meet the desired performance expectations. The environmental contingencies are crucial and essential to adapt the strategies. The modeling approach presented here enables this sophistication refinement for every contingency presented.

The innovation has been thoroughly studied by many authors in the academic community. In addition, open innovation concept has received tremendous attention from, both academicians and practitioners. The concept has been an explosion in the innovation function of many firms since it was introduced by Chesbrough (2003). He defines open innovation as “paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.” (Hossain, 2013). Open innovation concept emphasis on sharing knowledge within and among organizations (Abouzeedan and Hedner, 2012; Hossain, 2013). Necessary knowledge relevant to accomplish activities largely resides beyond a firm’s boundaries (Lakhani and Panetta, 2007).

Thus, it is important look at the practices of open innovation in the prospecting of knowledge and value creation. Value capture implies focusing on getting the biggest possible cut of the pie, whereas value creation involves innovation that establishes or increases the consumer’s valuation of the benefit of consumption (Priem, 2007). This research investigated the influence of practices of open innovation in the prospecting of value and value creation enhancing innovation and value creation. The knowledge is the recipient for success of open innovation. We have also seen a change in focus on how value is created. This leads us towards a long-ignored knowledge (and sources of knowledge) lens on both innovation and value creation in high tech companies.

CONCLUSIONS AND LIMITATIONS

This article aims to contribute to a policy of innovation management. To do so, it presents the influence practices of open innovation on the development of knowledge for value creation in highly complex environments. The study attempted to cover an existing space in the literature about innovation management based on the practice of open innovation in the prospecting of knowledge and value creation for highly complex environments, which is the case of high tech companies. The research was based on an extensive literature review, in which the components of the conceptual model (dependent and independent variables) were raised. The study is based on the state of the art to establish the structure and contents of the model. In fact, the innovation is not simply closed (that is, in-house developed) or open, rather it varies in a continuum between the above extreme modes.

Open innovation has been defined as “both a set of

practices for profiting from innovation and also a cognitive mode, for creating, interpreting and researching those practices'' (Chesbrough, 2006), ''the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively'' (Chesbrough et al., 2006) and ''systematically performing knowledge exploration, retention and exploitation inside and outside an organization's boundaries throughout the innovation process'' (Lichtenthaler, 2011; Bellantuono et al., 2013). Open innovation practices, in general, provide greater opportunities for firms to advance and commercialise their technologies and hence, enhance their innovation capability and international competitiveness (Chesbrough, 2003; Laursen and Salter, 2004; Clausen and Pohjola, 2009; Gassmann et al., 2010; Wynarczyk, 2013). In addition, open innovation allows for internal ideas to be taken to market through external channels, outside the firm's internal mechanisms, in order to generate additional value. Vanhaverbeke et al. (2008) have identified four broad advantages associated with open innovation practices, namely: (1) benefit from early involvement in new technologies and/or business opportunities; (2) access to other organizations' technological capabilities and R&D, through the combination of internal and external channels to market; (3) accessing venture capital funds; and (4) providing educational investments and joint venturing in potential projects at universities or research laboratories (Wynarczyk, 2013).

According to Huizingh (2011), open innovation practices are the processes that managers start when deciding ''when, how, with whom, with what purpose, and in what way should they cooperate with external partners''. Here, the practices of open innovation support the external knowledge prospecting and value creation in high tech industries. In fact, the benefits derived from good knowledge management are multiple, and include: reduced duplication of effort, creation of new knowledge, and increased efficiency and productivity, knowledge and innovation are the building blocks of sustainable competitive advantage (Porter, 1980), and therefore they are a source for sustainable development and growth for enterprises. The innovation is the use of innovative knowledge so as to create effective value for the stakeholders of the industry (Van Horne, Frayret, and Poulin, 2006). Here, the best practices of open innovation have been the value chain and partnerships and collaborations. In fact, all value chain activities are equally important as firms strive toward specific strategic goals. Porter (1980) suggests that achieving competitive advantage begins with an effort to develop deeper organizational expertise in performing certain competitively critical value chain activities (Prajogo et al., 2008).

In the research, cross-sectional data used in this study may not be appropriate to establish fundamental relationships between variables, but as referenced by Kenny (1979), the relationships that use cross sections are satisfactory and popularly accepted in relationship tests. Furthermore, a survey was developed for Brazilian companies in a static context, which may represent a limiting factor. Therefore, it is recommended to reproduce and replicate the model in companies from other countries in order to confirm the results. It is also recommended that the practices of open innovation dimensions should be extracted from the state of the art, but strongly confirmed by the state of practice, by the judgment of other experts (from other countries), taking into account that values, beliefs, cultures and experiences are determinants in the assessment, which can overturn the effects on the results. It is also underscored that the methodologies and technical basis of this modeling should undergo evaluation by a multidisciplinary team of specialists permanently and periodically, hence proposing possible additions or adjustments to these methodologies. And also replace some of the technical implementations used herein by others, in order to provide a similar role to verify the robustness of the model. Of the research findings, the high-tech industries undertake the ever-fast changes, intense competition and a highly uncertain and risky environment.

The effect produced by technology on the development of new products is equally intensive. Prospecting knowledge of R&D is crucial for practices of open innovation. It confirms the state of the art. Shanklin and Ryans (1984) suggest that high-tech companies anticipate potential technical and scientific capabilities that provide quick responses to the existing techniques, enabling to meet the market demands to be constructed or altered. It is reasonable to focus efforts on knowledge of R&D, thereby creating an internal stock of scientific knowledge (Feinberg and Majumdar, 2001; Griliches, 1979; Hall and Mairesse, 1995), which enables to develop and introduce new products, lower production costs, more competitive prices and greater financial return (Kafouros, 2008a, 2008b). Knowledge of R&D has indirect effects on increasing the organizational learning, enables to understand external ideas and technologies and apply them to the ultimate business outcome (Cohen and Levinthal, 1989) and also contributes to identifying areas that are still technologically unexplored (Miller et al., 2007). This logic will be maintained, however only through opening spaces for the various strata: partners, suppliers and customers. Nevertheless, the practices of open innovation in the prospecting of knowledge of high-tech companies will have to be anchored in efficient planning policies. One can argue that Brazil's high-tech industry still has a long way to go and also has tremendous growth potential. Hopefully Brazil can become a technological and competitive nation.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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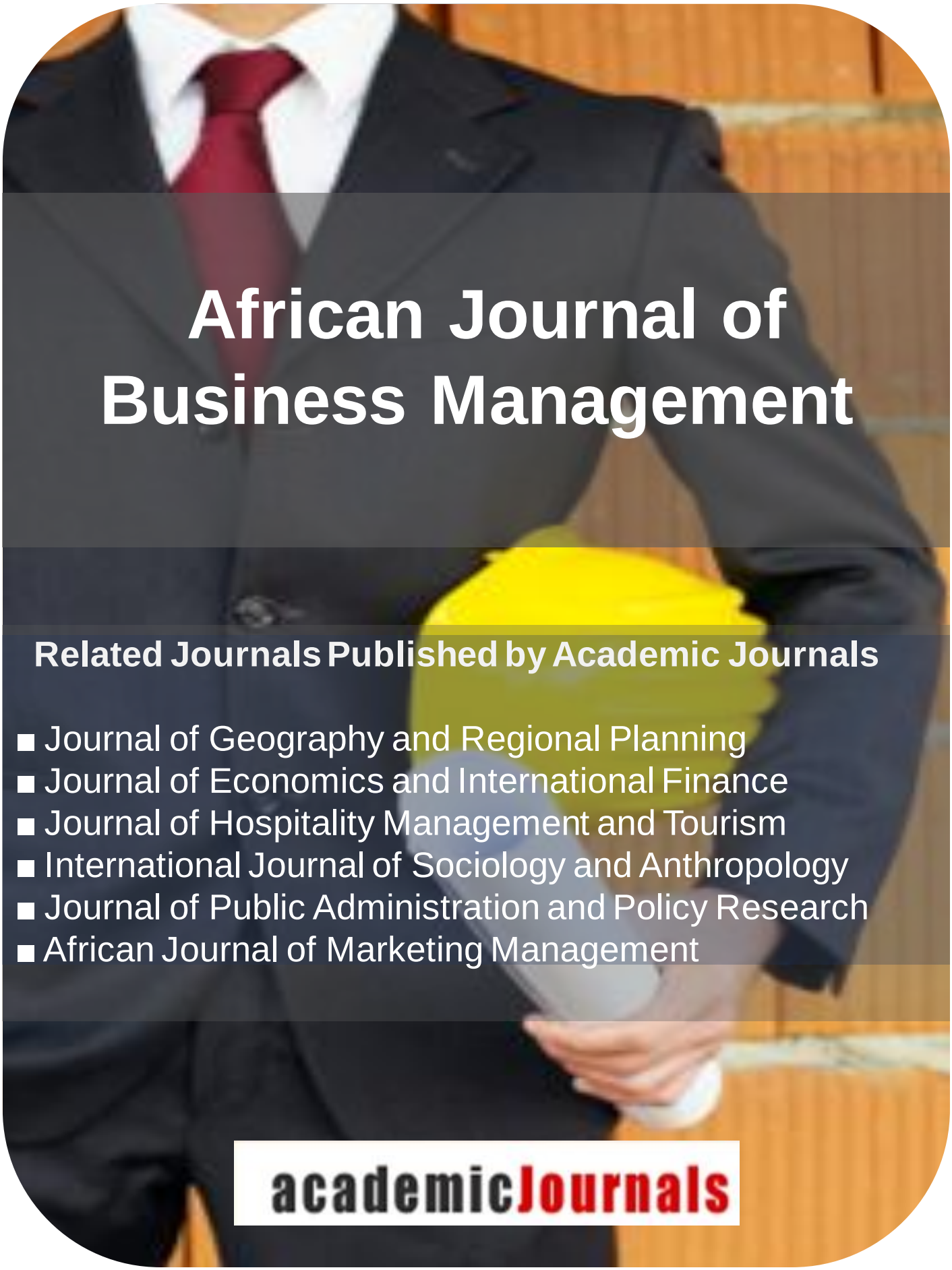

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