

NEW INDUSTRIAL SPACE THEORY – A CASE STUDY AND EMPIRICAL ANALYSIS OF FACTORS EFFECTING NEWLY EMERGING KEY INDUSTRIES IN QUEENSLAND

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ABSTRACT: Industry growth, stability and full employment are global economic aims of most nations and regions. Encouraging the development and relocation of ‘new economy industries’ is a significant component of that quest. From a theoretical aspect traditional neoclassical and behavioural theories have limitations to assist in addressing contemporary managerial interests and demands in the domain of location choice. However, the more recent ‘new industry space theory’ does assist in advancing our understanding. This paper uses an extensive case study analysis of Brisbane City Council to make application of that theoretical understanding. The research results provide insights into the locations factors that are considered important in selecting ‘new economy industries’. A sample of 130 organisations has been surveyed to determine the important location factors and their respective weight in the decision-making context. The research has indicated that the location-decision making variables are significantly different to those examined in previous ‘old-economy’ industries. The research concludes with a discussion on the implications for regional and local government, the academic community and individual firms.

1. INTRODUCTION

Rosabeth Moss Kanter, a Harvard Professor states:

in the future, success will come to those companies, large and small, that can meet global standards and tap into global networks. And it will come to those cities, states, and regions that do the best job of linking businesses that operate within them to the global community.” (Kanter, 1995)

Kanter’s statement is especially true in a regional economic sense as Australia moves towards becoming the ‘smart country’. One of the key issues to emerge from Kanter’s research into factors that contribute to the success of globally competitive companies is the symbiotic relationship between regional governments and industry partners in developing sustainable economic growth and stability. One of the most important foundation stones in this endeavour is the creation of the ideal fit between industry and the economic region. Economic competitive success of a firm is seldom seen in isolation from the region (Porter 1990). Economic benefits of the best regional fit accrue to firms and their stakeholders, to regional residents and to the national community. This article is directed towards the specific issue of industry location within the context of

selected and high technology related sectors. It takes as its theoretical premise the 'new industry space theory' concept as opposed to the neo-classical and behavioural location paradigms. The following section makes a brief examination of the three theories.

2. ALTERNATIVE LOCATION THEORY PARADIGMS

2.1 Neoclassical Location Theory

Studies on location decision-making by individual firms can be traced from Weber's neoclassical location theory of 1909. This theory generally considers only inputs from a range of material sources and directed outputs to a single point market. From this perspective the individual firm is seen as seeking a location at which total costs of production and transport are minimised. This framework is later broadened to incorporate factors such as substitution between transport costs, labour costs and external economies of scale claimed for industrial agglomerations. In essence, it can be characterised as a production-function cost minimisation approach (Hamilton, 1974).

However, neoclassical location theory has been criticised by some industrial geography scholars on the grounds that it ignores the influence of history, employs a limited concept of space and contain basic theoretical inconsistencies (Peet, 1989; Smith, 1989). These criticisms have cut deeply into the intellectual heritage of this paradigm (Knox & Agnew, 1989).

2.2 Organisational Behavioural Theory

To overcome some of the difficulties related to the neoclassical theory, and beginning from early 1960s, some scholars investigated an 'organisational behavioural approach' in searching for explanations of why and how firms chose different locations for facilitating business activities (Cyert & March, 1963; McNee, 1960, 1963, 1974; Pred 1967, 1969; Hamilton, 1974; Dicken, 1971). The behavioural analysis approach emphasises the individual firm while largely rejecting the particular method of inquiry associated with neoclassical economics. The analytical focus is typically on gathering information about organisational structures and decision-making processes. These studies have started to open the 'black box' of the enterprise using crude and frequently gross variables to describe organisational attributes and their impact on location decision-making (McDemott & Taylor, 1982). The course of de-industrialisation during the 1960s to 1980s in western economies added impetus for behavioural scholars to propose this new theoretical framework.

The two major theoretical approaches, the neoclassical and behavioural schools, are based largely on the analysis of the location decision of traditional manufacturing industries. For newly emerging industries, such as high-technology industries and the producer service industries, the validity of these two approaches theories became questionable. Therefore, a new kind of theory, usually termed the New Industry Space Theory, arose in the 1980s (Markusen, Hall, & Glasmeier, 1986; Scott, 1988, 1993).

2.3 New Industry Space Theory

This new theory became more popular in the 1990s and the 2000s and is sometimes referred to as the New Economic Geography Theory (Krugman, 1991; Hayter, 1997; Lindahl & Beyers, 1999; Gittell, Kaufman & Karson, 2000, Hanson, 2001). The theory is based on the social division of labour, the proliferation of small to medium-sized industrial establishments and the re-agglomeration of production and services industries. As a consequence, a series of new industrial spaces have emerged (Scott, 1988). These spaces comprise high-technology industry clusters that make extensive use of information technology, employ large numbers of highly skilled staff and operate extensive highly active inter-firm networks (Bathelt & Hecht, 1990). Scholars have identified new economic systems where:

...economic systems are characterised by an interdependent organisational and locational logic that engenders spatial agglomeration and rapid rates of local growth. Under conditions where the boundaries between economic sectors have become extremely blurred, the functional dimensions of the overall division of labour become more and more important as a criterion of the organisation. As the links between different economic functions, such as research and development, engineering, production, administration, logistics, become increasingly fine-tuned, so that specialisation and flexibility of functions increase, their tendency to agglomeration is enhanced. (Moulaert & Scott, 1997)

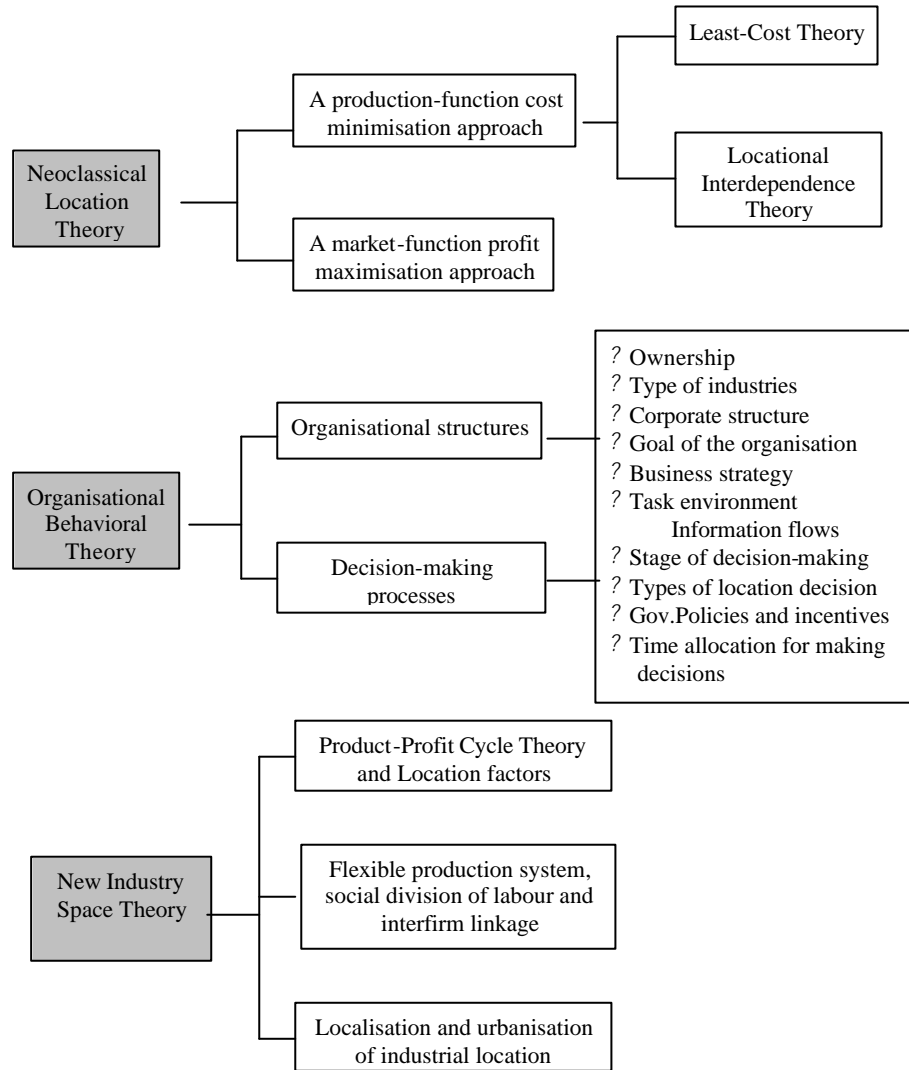
The new direction is a move towards a more comprehensive business networking approach. It reflects industry and workforce shifts under the advance of new technologies.

The three theoretical approaches discussed in this section can be compared in summary form as shown in Figure 1. In order to develop an improved understanding of the decision-making dimensions and the decision-making process of 'new industry space theory' a framework has as depicted in Figure 2 is employed. This framework in turn provides a framework to identify the factors that impact on location decision choice. These include the regional specific location factors, information processes, key decision-maker's characteristics, the organisational structure of the firm and the firm's specific decision-making elements. However, for the research at hand, only the 'decision-making elements' are considered.

3. RESEARCH QUESTION, OBJECTIVES AND FOCUS

The central research question is: *What are the key factors which are important to the location decision of key industries?*

Industry location decision-making is highly complex, involving multifaceted characteristics including tangible and intangible elements that are often very difficult to measure and evaluate (Hayter, 1997). The perfectly informed, rational and optimising 'economic person', often assumed in so much economic analyses, is rarely seen in practice; instead, organisations appear to act with imperfect knowledge and often in pursuit of nonmaterial ends (Smith, 1971). The notions of optimal decisions, minimising costs and maximising profits are,



Source: Based on the works of: Hoover 1948, Isard 1956, Smith 1966, Simon 1955, Hayter 1997, Scott 1988 and Storper & Harrison 1991.

Figure 1. Major Location Decision-Making Paradigms Compared

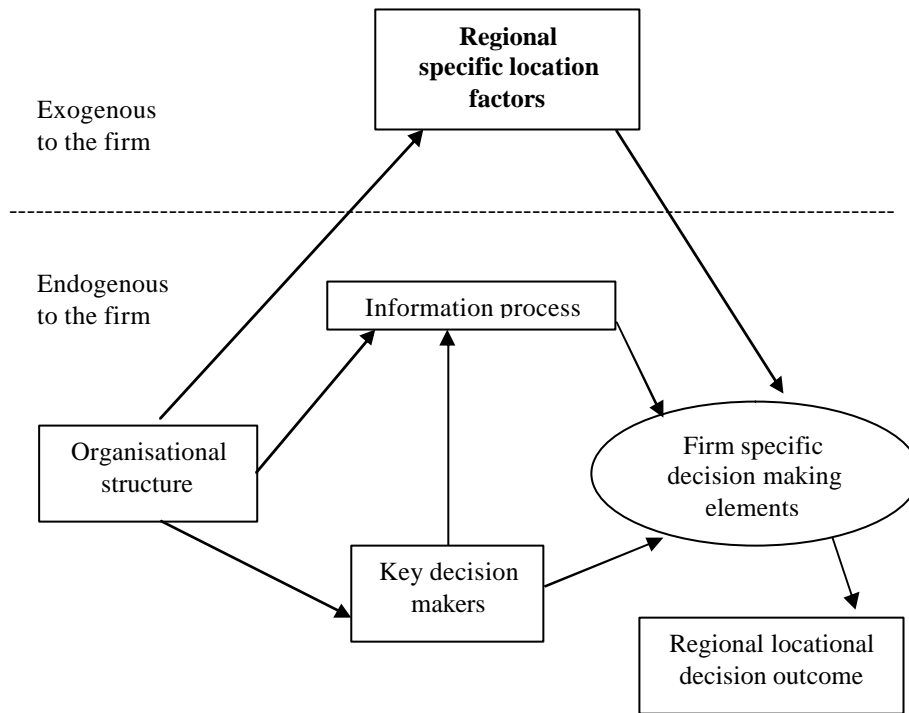


Figure 2. Theoretical Model of Location Decision Process

in this sense, theoretical abstractions. Organisations are ‘dense’ economic, cultural and political institutions that are not highly transparent and no individual is likely to possess complete knowledge (Barrow, 1998).

Regional governments need to understand location decision-making criteria of firms if they are to meet economic, social and political objectives and to understand how to develop and provide an environment, that offers a best-fit to deliver the maximum incentive for desired industries (Cheshire, 1999). The task is to secure the right occupational opportunities both now and for future residents of the region. Research into understanding the factors that determine a firm’s best-fit would assist in improving the provision of salient decision making information and aid in targeting and reaching key decision-makers. Obtaining knowledge about firms’ decision-making criteria would also assist regional governments in providing strategic information to local planners, real estate developers, infrastructure designers and marketers. Research information dissemination would further assist those engaged in the design of promotional strategies and advertising materials.

Traditional studies in the area of industrial location decisions have mainly focused on the manufacturing sector (Barrow, 1998). Manufacturing industries are generally strongly sensitive to raw material supplies, transport infrastructure, low and medium labour requirements and to fairly substantial land, infrastructure

and capital needs (Hayter, 1997). However, there is a newly emerging set of industries which are considered to be of high value and of importance to newly developing communities. These communities are typically found in the majority of the capital cities of Australia. These new emerging industries, for the focus of this research, are termed 'key industries' and have the characteristics of being:

- Service centred
- Frequently associated with discontinuous products
- Dominated by small and medium sized organisations
- Very rapid rates of expansion
- Entrepreneurial and highly adaptable
- Emphasising networking
- Focus on information technology as a significant component of the product
- Rich in knowledge, technology and capital
- Intensive cooperation among firms and alliances
- Employing highly educated and technological literate staff.

(adapted from Van den Berg and Braun, 1999).

Key differences between traditional manufacturing and these newly emerging industries are illustrated further in Table 1.

Table 1. Key Differences between Traditional and Newly Emerging Industries

Elements	Traditional Industries	Newly emerging Industries
Material resource dependent	Very High	Very Low
Intellectual skill dependency	Very Low	Very High
Capital dependency	Very High	Low to Medium
Technology dependent	Low	Very High
Transport dependent	Very High	Very Low
Network relationships	Very Low	Very High

The industries used in this empirical research are selected from those of special interest to the Brisbane City Council Office of Economic Development. These have been earmarked by senior management as being of significance for long-term economic growth for the region. The selected industries include: Information Technology, Aviation, Creative Industries, Biotechnology, Telecommunications, Food and Beverage, Manufacturing, Electronics, Warehouse and Transport and Commerce. However, to maintain a sharp research focus only the first five of the categories are chosen for examination.

The selected industries do not necessarily represent those of all capital regions but they are essentially those considered desirable by the Brisbane City Council (BCC). All the industries selected had a reasonable presence in the BCC region, some over a considerable time and others, such as the Aviation Industry, have made a relatively recent appearance.

3. RESEARCH DESIGN, QUESTIONNAIRE CONSTRUCT AND ADMINISTRATION

To establish the critical elements of location decision making for the 'key industries', and to examine their relative importance, a triangulation of methodologies is used. The first stage comprised an expert panel focus group followed by a series of in-depth interviews. The outcomes of the two components of the exploratory research were linked to the design of a qualitative questionnaire administered to 450 individuals employed in the selected industry clusters.

The expert panel focus comprised four senior trade related officers from the Office of Economic Development (OED) in BCC, and the Department of State Development of Queensland State Government. It included three senior academics with expertise on location theory, regional economic development, organisational behaviour and marketing. They, in conjunction with a literature review, were able to provide a foundation of expert knowledge to assist in highlighting the factors considered most likely to impact on location decisions in key industries. In addition, they were also useful in selecting appropriate representative organisations from the key industry in the Brisbane region for in-depth interviewing. Companies executives were not included in the focus group as these were the object of the in-depth interviews conducted in the next phase of the study. The focus group discussion was tape recorded and transcribed. The panel provided key insights into new variables in addition, to verifying those found in the literature, and especially those examined by Markusen, et.al., 1986; Galbraith & De Noble, 1988; Porcano, 1993; Lindahl & Beyers, 1999 and O'Mara, 1999.

The open-ended interviews focused on how the decision-making criteria were established, collected, weighed and incorporated into the decision-making process. Four senior executives were selected for interviewing from each of the five key industries. The interview process adopted the 'self-report' and 'decision process tracing' methods for examining both quantitative and qualitative criteria. Interviews, which lasted between 25-40 minutes, were tape-recorded, transcribed and textually analysed through the categorisation technique to assist in indexing, searching, theorising and aiding a scale construct.

The final stage was the design and administration of a questionnaire. This was constructed from the elements of the previous exploratory studies. Each question focused on one variable. To ensure the respondents answered accurately, a clear instruction was given under each question where necessary. A total of twenty-three questions were incorporated at they relate to those variables under examination as indicated in Table 2.

The majority of the questions used a Likert scale with seven categories. The questionnaire was pre-tested with the twenty executives who participated in the in-depth interviews and five senior academics. Only a few minor changes were considered necessary. The questionnaire was posted with an SAE return envelope to 450 executives of firms in the BCC region representing the five selected key industry clusters. The sample frame was taken as those industries

collated from the OED database.

Table 2. Variables to be Examined in Case Study

Research areas	Key variables	Sub variables
Location factors	1. Proximity	<ul style="list-style-type: none"> • to CBD • to clients • to suppliers • to similar firms • to intellectual property holder • to R& D collaborators • to where the decision maker of the company lives
	2. Business operating cost	<ul style="list-style-type: none"> • Business premises cost • Labour cost • Transportation cost
	3. Infrastructure	<ul style="list-style-type: none"> • Business premises specific infrastructure • Transportation • Telecommunication • Complementary business services • Finance
	4. Employment	<ul style="list-style-type: none"> • Availability of highly skilled staff • Availability of casual and short-term unskilled labour • Ability to attract skilled staff • Ability to retain staff
	5. Amenities	<ul style="list-style-type: none"> • Life style • Ability to cater business clients from outside of Brisbane • Cost of living
	6. Other variables	<ul style="list-style-type: none"> • Availability of area for business expansion • Collaboration with local and regional industries • Collaboration with local research and education institutions • Pool of local scientific and engineering talent • Government policies and inducements • Accessibility to public transport

A total of 137 cases were received and entered into the Statistical Package for the Social Sciences (SPSS Version 11.5) software. The final data set was reduced to 130 cases through the application of data cleaning. The sample received were represented by industries of: IT - approximately 40 percent, Electronics and communication - approximately 20 percent, Biotechnology - approximately 15 percent, Creative - approximately 20 percent, and Aviation - approximately 5 percent.

The headquarters were based in: Queensland 75 percent, other States 15

percent and the balance were overseas. The size of the represented firms was: 73 percent with less than 30 staff, 16 percent between 31 to 100 staff and 16 percent more than 100 staff. More than half of the firms (54 percent) had been in operation less than 10 years

4. ANALYSIS AND FINDINGS

To respond to the research question of “*What location factors are important to the location decision of the key industries?*” a comparison of means test was undertaken. This was used for obtaining the ranks of the top ten most important location factors for all the key industries. The variables, based on the respondents’ rating of the importance of each location factor variable, were measured on a scale where 1 = not important, and 7 = extremely important. Variables with the top ten highest mean scores of the overall five key industries and each individual industry were listed with their corresponding means, as shown in Table 3. The factors were compared across categories, identifying differences and similarities. Differences across categories were tested for significance using a one-way ANOVA.

With respect to the most important variables for the five key industries it was found that ‘business premises cost’ was the highest rated (M = 5.32). Secondly, was the need of ‘availability of telecommunications infrastructure (M = 4.95). This was followed, and with no significant mean differences, by the ‘ability to cater to business clients’ (M = 4.35), the ‘proximity to CBD (M = 4.33) and the need to have close ‘proximity to client’ (M = 4.31). Close to the above, was the need for special infrastructure (M = 4.26). Of interest was the need to have ‘provision of a suitable lifestyle for employees’ (M = 4.15). However, by comparing the results from different industry sectors, there are distinctions within the key industries sectors. Some of the key findings are indicated below.

The IT industry considers ‘suitable lifestyle’ (M = 4.63) being as of high importance as the ‘ability to retain staff’ (M=4.31). Regarding the Biotech industries the ‘pool of scientific talent’ is critical, being ranked by them as the third most important criteria (M = 5.06) and this is followed by ‘collaboration with local research and education institutions (M = 5.00). Regarding the ‘creative industry’ cluster, the second most important factor was ‘proximity to the CBD’ (M = 5.08). Further, in their top 10 list was the ability to ‘attract staff’ (M= 3.08). With respect to the telecommunications industry group unlike most of the other clusters, the issue of ‘business premises infrastructure’, the ‘provision of a suitable lifestyle for employees’ and the ‘availability of area for business expansion’ was not listed in their top ten criteria. Lastly, the aviation industry views a location that has high ‘business premises special infrastructures’ (M = 5.6) and also of importance was ‘local government support’ (M= 5.6) and ‘government inducement’ (M=5.2).

The three most important business factors in the location of key industries are ‘business premises cost’, ‘availability of telecommunication infrastructure’, the ‘ability to cater to the business client’ and the ‘proximity to the CBD’. Of the top ten variables that surface 6 of them relate to communications. These findings confirm the qualitative research obtained through the in-depth interviews.

Table 3. Top Ten Most Important Location Factors to Key Industries

Factor	Overall Key Industries N=130 Rank (Mean)	IT N=49 Rank (Mean)	Electronic/ Telecom N=24 Rank (Mean)	Biotech. N=49 Rank (Mean)	Creative N=49 Rank (Mean)	Aviation N=49 Rank (Mean)
Business premises costs	1 (5.32)	2 (5.18)	1 (5.46)	1 (5.89)	1 (5.19)	1 (5.60)
Availability of telecom infrastructure	1 (4.95)	1 (5.71)	2 (4.71)	6 (4.78)	6 (4.08)a	
Ability to cater to business client	3 (4.35)	3 (4.69)	6 (4.00)		4 (4.42)	
Proximity to CBD	4 (4.33)	8 (4.24)	3 (4.21)		2 (5.08)	
Proximity to Client	5 (4.31)	9 (4.22)	4 (4.08)		3 (4.65)	1 (4.00)
Business premises special infrastructure	6 (4.26)	7 (4.25)		2 (5.55)b	8 (4.00)	2 (5.60)
Provision of a suitable lifestyle for employee	7 (4.16)	4 (4.63)b		7 (4.56)	5 (4.12)	
Availability of area for business expansion	8 (4.12)	6 (4.27)		5 (4.89)	7 (4.04)	8 (4.40)
Ability to retain staff	9 (4.06)	5 (4.31)	8 (3.83)	10 (4.22)		7 (4.40)
Access to transport infrastructure	10 (3.93)		7 (3.88)			
Accessibility to public transport		10 (4.06)			9 (3.81)	
Proximity to where key decision-maker lives			5 (4.04)			
Ability to attract staff			9 (3.67)		10 (3.80)	6 (4.40)
Access to shops & cafes			10 (3.62)			
Pool of local scientific talent				3 (5.06) acd.		
Collaboration with local research & educational institutions				4 (5.00)abc		
Proximity to R&D collaborators				8 (4.50)abcd		
Cost of living				9 (4.28)c		
Government support (in general)						3 (5.60)
Government inducement						4 (5.20)c
Labour Cost						5 (4.40)
Collaboration with local & regional industries						9 (4.40)

Notes: Minimum score=1, Maximum score=7, statistically significant at the 0.05 level. a. significantly different from IT industry; b. significantly different from electronic/telecommunications industry; c. significantly different from creative industry; d. significantly different from aviation industry.

However, the results stand in some contrast with many previous studies which have been based on the location decision criteria of traditional firms.

In general, the location considerations are based on decisions with respect to 'proximity to clients' rather than 'proximity to suppliers' as is generally reflected in the neoclassical paradigm. The outcomes of this study reflect the nature of the key industries, which are highly dependent on technological infrastructure, organisational networks and intellectual capital, rather than on material resource suppliers (Hayter, 1997). On the other hand, it might also reflect a growing trend towards having a customer focus, as a location that allows firms to 'cater to their business clients'. This was ranked as the third most important location factor ($M = 4.35$).

Other considerations should also be considered important: the 'ability to attract and retain staff' ($M = 4.06$) was regarded as one of the top ten decision variables for key industries but the 'availability of skilled labour' seemed to decline in importance. Indeed, it did not appear in the top ten important location factors from this study. This may be due to labour market changes in the last decade, and a shortage of IT professionals not being as serious today as it was in the early 1990s (Bathelt & Hecht, 1990; Haug, 1991; De Noble & Galbraith, 1992). However, the availability of skilled labour in a given location is still a concern for key industries, but it is not as important as other location factors.

Similar to the findings of De Noble & Galbraith (1992) and O' Mara (1999), this research found that the factor 'suitable lifestyle for their employee' is commonly cited as one of the important decision criteria by the majority of the key industry groups. In addition, the 'availability of area for business expansion' was also regarded as an important criterion for selecting a business location. This may reflect the rapid growth being experienced in key industries so that they need to consider a location with room for expansion.

There is evidence of different rankings of various industries as indicated in Table 3. However, for all key industries 'business premises cost' ($M = 5.32$) was considered to be of supreme importance. This may be a necessary but not sufficient category condition.

Of the five key industries, the Biotechnology sub category expressed different requirements for location. The survey results show that this industry expresses more concern for 'pool of scientific talent' ($M = 5.06$) and 'collaboration with local research and educational institutions' ($M = 5.00$). This again supports the findings from the in-depth interview-based qualitative study, which is possibly being due to the need to set up specially equipped laboratories. Further, Biotechnology firms also rate 'proximity to R&D collaborators' ($M = 4.5$) as being critical. This may be due to the industry's need to be engaged with R & D activities in the Brisbane region. It confirms the theory of localisation of academic and industrial knowledge spill over effects (Adams, 2002).

The Aviation industry expressed a strong need for 'government support which included general service and inducement' ($M = 5.60$ and 5.20). This may be due to the high level of location-specific investment required in the Aviation industry.

5. IMPLICATIONS AND CONCLUSIONS

For theory development, this research comprises an analysis of the influencing of factors involved in the location decision of key industries. Although there is some literature devoted to understanding this process, little research has been undertaken from a marketing perspective. Kotler et al., (1999) and Swinden (1993) have undertaken some studies of the location decision process of industries in that domain. However, there appears to be little research related specifically to the location decision of key industries.

Research on industry location decision-making process could assist regional and local governments in targeting and attracting overseas and interstate investments. Understanding the factors that determine a firm's best-fit would assist in improving the provision of salient decision making information and aid in targeting and reaching key decision makers. This study has identified the most important regional specific location factors of key industries. The findings imply that, although key industries have different requirements for a business location in comparison to traditional industries, there are also distinctions between them based on the relative importance of location factors. This study suggests that these differences are largely affected by the organisational structure of the firm, through differences in weighting given to location factors. Policy makers should recognise these variations and understand the causes of these variations in order to formulate appropriate strategies to attract industries that will best serve the region. Obtaining knowledge about a firm's decision-making criteria would also assist regional governments in providing strategic information to local planners, private developers, infrastructure designers and marketers. Research findings on the information processes of firms provide further assistance to those engaged in the design of promotional strategies and advertising materials. Meanwhile, it also implies that a specific channel could effectively disseminate appropriate information to the right audience.

The results of the research also provide insights for individual companies both locally and internationally in developing location decision-making criteria, processes and procedures.

Whereas the literature on new industry space is growing in momentum there is a need to expand this understanding and to engage in vigorous testing of ideas. There is a strong need to go well beyond the conceptual principles and to engage in empirical development and testing of theoretical models.

This study has empirically identified and examined the critical factors related to the location of key industries. It has focused on five selected industry clusters that are resident in the BCC economic industry region. The study of 130 companies has revealed that the key industry firms share relatively common characteristics in the area of decision location factors. These stand in direct contrast to studies conducted on more traditional manufacturing industries of the past. The importance of understanding these factors is critical for regional governments who maintain programs for improved infrastructure and are responsible for obtaining the optimal mix of industries that are critical to each other. For firms and industries the identified factors are important to understand

as they enable them to make sound judgement in location decision making choices. For academic research the study is of considerable benefit as it lays a foundation for more intensive studies in the newly emerging industry clusters. This study, along with others of this nature, assists in opening the door of understanding in the area of location theory and practices as they relate to the newly emerging industries. These industries, by their nature, are highly networked and integrated and employ highly sophisticated trained staff. Also they are dominated by SMEs.

The unique characteristics of the location decisions of key industries warrant more in-depth research. Extended and replicated studies will improve understanding of the location decision of key industries and contribute to knowledge in the area of further theory development.

This research paper has been a first attempt at exploring a newly emerging industry group and it is not without its limitations. Firstly, the sample is limited and some sub-groups, such as the Aviation industry, are exceptionally small for quantitative analysis. Secondly, only five key industries have been included in the research. This cannot be considered to be representative; there are many major industries which may be included. For example, those regions dominated by the motor vehicle industry, those that have high levels of concentration in the print industry or those focused on computer design and software. Each region will have its own unique blend of sub-industry clusters. Thirdly, the study has focused on one region only of Queensland. Despite its applicability to that local region it cannot be assumed to apply to other regions, but the sample chosen has been suitable for the purpose of the research under investigation, however, the obvious limitations should be noted.

Regarding the research methodology, an attempt has been made to triangulate the findings through the literature, an expert panel, in-depth interviews and surveys. However, no attempt has been made to check the validity of the findings by reinterviewing the participants to obtain a 360 feedback. In addition, no attempt has been made to examine those companies that have included Brisbane in their decision-making set but have not decided to come to the city to establish their business. However, results of such a study would have proved of value but they are beyond the scope of this research.

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