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Dimensions of Industrial Location Factors: Review and Exploration

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Abstract

Industrial location is an increasingly important decision facing both national and international firms. Given that no operational measures of the critical factors affecting a firm's industrial location decision exist, this paper develops an instrument for the critical factors. The developed instrument, consisting of 14 dimensions, passed through a stringent empirical validation test, and is based on extensive literature search and psychometric principles. A total of 95 items were retained for the instrument. The main objective of the paper is to describe the methodology used in the development process. The paper provides a detailed presentation of how content and construct validity are assured. The process of identifying the fourteen critical factors utilized judgments by the authors and a group of industrial location professionals. A total of 2125 executives of industrial firms from all over the world participated in the study (23 countries). The general critical factors of industrial location are transportation, labor, raw materials, markets, industrial sites, utilities, government attitude, tax structure, climate, and community. In addition, for international location considerations, four general factors are identified: political situation of foreign countries, global competition and survival, government regulations, and economic factors.

Introduction

Historically, the focus for industrial location research has been on those variables influencing the choice of location for new firms. The importance played by the variables is demonstrated by their extensive use in studies involving the selection of industrial sites (Isard, 1956; Smith, 1966, 1981; Beckman, 1968; and Greenhut, 1974).

In their prescriptions for industrial location planning, many authors (Greenhut, 1959; Greenhut and Colberg, 1962; Dean, 1972; Nicholas, 1974; Spooner, 1974; Foster, 1977; Brown, 1979; and Moriarty, 1980) repeatedly emphasize the importance of critical **demand** factors (location of competitors, proximity to consumer markets, etc.), and **cost** factors (land, labor, materials, transportation, etc.). The literature implies that as the firm's decision makers develop better identification, analysis and assessment of these critical factors, the location decision making process will improve and result in effective long term performance for the organization (Miller, 1967; Weber, 1972; Walker, 1975; and Saxenian, 1985).

Unfortunately, to date there has been no systematic attempt to organize and synthesize the various sets of critical factors influencing industrial location, nor have valid and reliable measures for those factors been developed. Such operational measures will be useful to both researchers and corporate decision-makers. The measures can also be used to develop theory and decision models to further research in the area and increase understanding of the decision process itself. With a better understanding of the process, decision support systems can be developed to incorporate the decision models, thus providing effective location decision aids for location planners.

An absolute requirement for the development of any valid and reliable decision model is the identification of valid and reliable factors. In pursuit of that goal the authors carried out the study described in the following paper, which resulted in the identification of fourteen critical dimensions of location planning and action. These psychometrically determined "critical factors" are those that should be evaluated by decision makers in order to reach a sound industrial location decision.

It should be pointed out that qualitative discussion of location factors is common, but careful empirical work has been greatly hindered by data scarcity. This study, carried out between December 2004 and June 2006, uses an extensive data source to take a new look at the measurement list.

The industrial location literature points out to shortages of valid and reliable instruments for measuring the importance of industrial location factors. This paper attempts to enrich the industrial location library by trying to answer the following three major questions:

1. What are the major dimensions of modern industrial location factors?

2. What are the detailed factors of industrial location factors?

3. What are the factors of modern international industrial location factors?

The format of the paper first provides an analysis of the industrial location literature from which the critical factors were derived. Next, the process of developing the measurement instrument is presented. The psychometric properties of the measures are examined, and recommendations for future research indicated.

Critical factors of industrial location - Review

A comprehensive set of fourteen critical factors influencing industrial location decisions were developed through a process that involved the identification and synthesis of the critical requirements that have been prescribed by practitioners and academics from various disciplines.

In the review, we attempted to cover all trends in, and approaches to industrial location decision. The review includes Thunen (1875), Laundhart (1885), Weber (1929), Hotelling (1929), Ohlin (1935, 1952), Smithies (1941), Lerner and Singar (1937), Chamberlain (1946), Losch (1954), Hoover (1937, 1948), Greenhut (1959, 1963, 1974, 1981), Isard (1956, 1959), Vernon (1968, 1971), Bass, McGregor and Walters (1977), Horst (1972), Belli (1970), and others. Table 1 summarizes the critical factors discussed by these and other authors.

General location factors

Thunen developed the general framework for the economic analysis of Location Theory (Thunen, 1875 and Isard, 1956). He was primarily concerned with the aggregate analysis of agricultural location. He utilized the "least-cost" approach to location. Of the early theorists, Launhardt, whose work appeared in 1885, provided the most significant contributions (Laundhardt, 1885 and Miller, 1977). Launhardt explained the differences in the location of industry by variations in cost and demand factors at alternative locations. He demonstrated the importance of transportation costs. Weber developed a comprehensive theory in 1909 for the location of manufacturing activities (Weber, 1929 and Isard, 1956). Three determinants or factors are considered: transportation costs, labor costs, and what Weber referred to as agglomeration forces. Many location studies use the Weberian theory to better understand the decision making process (Tellier and Vert Fenille, 1995).

In 1929, Harold Hotelling produced a pioneering paper that established the foundation of locational interdependence. He claimed that firms would tend to locate toward the center of the market area rather than disperse. He introduced the notion of competition in location decisions. Lerner and Singar (1937) based their study on Hotelling's, but disputed the belief that producers will always tend to cluster together. Three factors are determined for location: the size of the market, the cost of transportation, and the price buyers are willing to pay for a delivered commodity.

Others who tried to expand on Hotelling's theory by introducing uncertainty (risk) into the environment include Balvers and Szerb (1996). Katz (1995) examined the model by introducing a one-dimensional bounded space without a boundary. Smithies (1941), and Chamberlain (1946) are also contributors to the formulation of the interdependence model. Ohlin (1935, 1952) was the first to attempt to integrate regional trade theories and location theories. In summary, these writers, working independently, discovered three general influences, which have a major effect on plant location, marginal cost curve, type of demand curve, and shipping rates.

August Losch presented the maximum-profit theory in 1939. Losch's analysis assumes a free economy where the optimum placement of the individual enterprise in different sites can be determined from the cost and demand curves. Hoover attempted to integrate cost and demand factors into a theory to explain industrial location in a capitalistic (Hoover, 1937, 1948). Hoover stressed that due to freight rates, transportation costs do not increase proportionally with distance. In 1956, Greenhut presented a general theory of plant location. His purpose was to integrate location theory with practice, and to formulate a general location theory involving both cost and demand factors. Recently, Button (1996) provided an impressive assessment of Greenhut's idea of economics of location, location theory, and spatial microeconomics. Isard (1956; Isard et al., 1959) attempted to develop principles for a general theory of location by combining the work previously done by Thunen, Weber, Losch, and other theorists.

He explained industry location in a production economy framework. He uses the substitution effect and the concept of transportation inputs as tools of his analysis.

Table 1: Critical factors of industrial location

Critical Factors	**Explanation of Critical Factor**	**Literature References**
Transportation	Pipeline facilities. Airway facilities. Highway facilities. Railroad facilities. Trucking services. Waterway transportation. Shipping cost of raw material. Cost of finished goods transportation. Availability of postal services. Warehousing and storage facilities. Availability of wholesale outlets.	Hoover, 1937; Losch, 1954; Greenhut, 1956, 1962; Alexander et al., 1959; McMillan, 1965; Beckmann, 1968; Chisholm, 1971; Fales and Moses, 1972; Nelson, 1973; Lowe and Moryadas, 1975; Bater and Walker, 1977; Moriarty, 1980; Hoyle et al., 1981; Schmenner, 1982; McKinnon, 1983, 1989; Haitani and Marquis, 1990; Gold, 1991; Pietlock, 1992; Thisse et al., 1996.
Labor	Low cost labor. Attitude of workers. Managerial labor. Skilled labor. Wage rates. Unskilled labor. Unions. Educational level of labor. Dependability of labor. Availability of male labor. Availability of female labor. Cost of living. Worker stability.	Greenhut, 1956, 1962; McMillan, 1965; Townroe, 1969; Olson, 1971; Carnoy, 1972; Rees, 1972, 1983; Norcliffe, 1975; Sant, 1975; Keeble, 1976; Friedman, 1977; Pred, 1977; Dicken and Lloyd, 1978; Gudgin, 1978; Moriarty, 1980; Cobb, 1982; Massey and Meegan, 1982; Schmenner, 1982; Dorfman and Route, 1983; Malecki, 1984; Massey, 1984; Noyelle and Stanback, 1984; Grundwald and Flamm, 1985; Saxenian, 1985; Dicken, 1986; Lund, 1986; Ballance, 1987; Hanson, 1988; Schoenberger, 1988; Haitani and Marquis, 1990; Coughlin et al., 1990, 1991; Gold, 1991; Pietlock, 1992; Wheeler and Mody, 1992.
Raw Materials	Proximity to supplies. Availability of raw materials. Nearness to component parts. Availability of storage facilities for raw materials and components. Location of suppliers. Freight cost.	Weber, 1929; Greenhut, 1956, 1981; McMillan, 1965; Auty, 1975; Miller, 1977; Moriarty, 1980; Schmenner, 1982 & Storper, 1985; Wheeler and Mody, 1992.
Markets	Existing consumer market. Existing producer market. Potential consumer market. Anticipation of growth of markets. Shipping costs to market areas. Marketing services. Favorable competitive position. Income trends. Population trends. Consumer characteristics. Location of competitors. Future expansion opportunities. Size of market. Nearness to related industries.	Fetter, 1924; Hotteling, 1929; Hoover, 1948; Losch, 1954; Greenhut, 1956, 1962, 1981; McMillan, 1965; Chisholm, 1971; Carnoy, 1972; Beyers, 1974; Foust, 1975; Miller, 1977; Pred, 1977; Dorward, 1979; Moriarty, 1980; Schmenner, 1982; Dorfman and Route, 1983; Gough, 1984; Walters and Wheeler, 1984; Saxenian, 1985; Lund, 1986; Tosh et al., 1988; McKinnon, 1989; Haitani and Marquis, 1990; Pietlock, 1992; Simons, 1992; Wheeler and Mody, 1992.
Industrial Site	Accessibility of land. Cost of industrial land. Developed industrial park. Space for future expansion. Insurance rates. Availability of lending institutions. Closeness to other industries. community industrial development projects. Attitude of financing agents.	Hoover, 1948; Greenhut, 1956; Eversley, 1965; McMillan, 1965; Smith, 1966, 1981; Chisholm, 1971; Spooner, 1974; Bater and Walker, 1977; Gudgin, 1978; Lipietz, 1980; Moriarty, 1980; Sable, 1982; Schmenner, 1982; Kostler, 1984; Lloyd and Mason, 1984; Norcliffe, 1984; Brusco, 1985; Grundwald and Flamm, 1985; Hall, 1985, 1985; Mason and Harrison, 1985; Mason, 1987; Hudson, 1988; Coughlin et al., 1990, 1991; McConnell and Schwab, 1990; Wheeler and Mody, 1992.
Utilities	Attitude of utility agents. Water supply, cost and quality. Disposable facilities of industrial waste. Availability of fuels. Cost of fuels. Availability of electric power. Cost of electric power. Availability of gas. Adequacy of sewage facilities. Availability of coal and nuclear facilities.	Greenhut, 1956; McMillan, 1965; Bater and Walker, 1977; Heckman, 1978; Moriarty, 1980; Forbes, 1982; Schmenner, 1982 & Walters and Wheeler, 1984; McConnell and Schwab, 1990; Gold, 1991; Pietlock, 1992; Rex, 1993.
Government Attitude	Building ordinances. Zoning codes. Compensation laws. Insurance laws. Safety inspections. Nuisance and stream pollution laws.	Greenhut, 1956; McMillan, 1965; Schmenner, 1982; Rees, 1983; Hudson, 1988; Tosh et al., 1988; Coughlin et al., 1990, 1991; Young, 1994.
Tax Structure	Tax assessment basis. Industrial property tax rates. State corporate tax structure. Tax free operations. State sales tax.	Greenhut, 1956; McMillan, 1965; Moriarty, 1980; Schmenner, 1982; Tosh et al., 1988; Haitani and Marquis, 1990; Coughlin et al., 1990, 1991; Wheeler and Mody, 1992; Fleischman, 1995; Young, 1994; Luce, 1994.
Climate	Amount snow fall. Percent rain fall. Living conditions. Relative humidity. Monthly average temperature. Air pollution.	Greenhut, 1956; McMillan, 1965; Dean, 1972; Spooner, 1974; Moriarty, 1980; Schmenner, 1982; Haitani and Marquis, 1990; McConnell and Schwab, 1990.

Critical Factors	**Explanation of Critical Factor**	**Literature References**
Community	Colleges and research institutions. Attitude of community residents. Quality of schools. Religious facilities. Library facilities. Recreational facilities. Attitude of community leaders. Medical facilities. Shopping centers. Hotels and motels. Banks and credit institutions. Community position of future expansion.	Greenhut, 1956; Eversley, 1965; McMillan, 1965; Dean, 1972; Spooner, 1974; Bater and Walker, 1977; Mason and Harrison, 1977; Massey, 1977, 1979, 1984; Gudgin, 1978; Moriarty, 1980; Schmenner, 1982; Rees, 1983; Grundwald and Flamm, 1984; Lloyd and Mason, 1984; Malecki, 1984; Hall, 1985; Dicken, 1986; Ballance, 1987; Mason, 1987; Haitani and Marquis, 1990; McConnell and Schwab, 1990; Simons, 1992; Rex, 1993.
International Location Factors		
Political Situation of Foreign Country	Relations with the west. History of country. Stability of regime. Protection against expropriation. Treaties and pacts. Attitude in the United Nations. Type of military alliances. Attitude toward foreign capital.	Carnoy, 1972; Dicken and Lloyd, 1978; Anell and Nygren, 1980; Hughes and Ohlin, 1980 & Ballance, 1987; Wheeler and Mody, 1992; Young, 1994.
Global Competition and Survival	Material and labor. Market opportunities. Availability of capital. Proximity to international markets.	Friedman, 1977; Ballance, 1978; Forbes, 1982; Grundwald and Flamm, 1985; Haitani and Marquis, 1990; Pietlock, 1992; Wheeler and Mody, 1992.
Government Regulation	Clarity of corporate investment laws. Regulations concerning joint ventures and mergers. regulations on transfer of earnings out of country. Taxation of foreign owned companies. Foreign ownership laws. Requirements on what percentage of employees may be foreign. Prevalence bureaucratic red tape. Regulations concerning price controls. Requirements for setting up local corporations.	(Anell and Nyrgren, 1980; Hudson, 1983; Ward, 1982; Rees, 1983; Haitani and Marquis, 1990; Coughlin et al., 1990, 1991; Wheeler and Mody, 1992.
Economic Factors	Standard of living. Per capita income. Strength of currency against US dollar. Balance of payment status. Government aids.	Thunen, 1875; Olson, 1971; Carnoy, 1972; Friedman, 1977; Dicken and Llloyd, 1978; Forbes, 1982; Hudson, 1983, 1988; Walters, 1984; Ballance, 1987; Schoenberger, 1988; Haitani and Marquis, 1990; Coughlin et al., 1990, 1991; Pietlock, 1992; Wheeler and Mody, 1992.

Empirical studies of industrial location

A review of empirical studies of industrial location reveals some of the most influential factors in making a decision to locate industrial plants at particular sites (Luttrell, 1962; Smith, 1966; Karaska, 1969; Cameron and Clark, 1966; Carnoy, 1972; Keeble, 1976; Dorward, 1979; Cobb, 1982; Forbes, 1982; Lloyd and Mason, 1984; Walters and Wheeler, 1984; Brusco, 1985; and Mason and Harrison, 1985; Mazzarol and Choo, 2003; Wood and Parr, 2005). Most often cited factors of industrial location are distance to market, distance to materials, prevailing wage rates (labor costs), productivity of workers, availability of labor, adequacy of transportation, closeness to producers, industrial climate, taxes, anticipation of market growth, transportation costs, availability of land for future site expansions, cost and availability of utilities, political climate toward business, population growth, and income levels of consumers. These factors can be classified into three basic categories: markets, labor, and community environment.

Some new factors of industrial location have emerged that are worthwhile considering. These factors include proximity to schools, colleges and universities (Audretsch and Stephen, 1996), interaction between location and taste for remote access (Degryse, 1996), type of linkage between vertically linked industries (Venables, 1996; Carod, 2005), characteristics of population trends (Braid, 1996; Mayer, 1996; Mazzarol and Choo, 2003), percent of market share or expected market share (Drezner and Drezner, 1996), changes in the location of users (Hansen and Roberts, 1996), amount of expected development potential in the region (Wojan and Pulver, 1995), level of wages (Manders, 1995; Ma, 2006), changes in transport rates (Mai and Hwang, 1994; Leitham et al., 2000; Mazzarol and Choo, 2003), location of other competitors (Serra and ReVelle, 1994; Cieslik, 2005; Siebert, 2006), types and availability of resources (Vaughn, 1994; Chan, 2005), effect of changes in local demand (Justman, 1994; Figueiredo et al., 2002), and hazardous waste and pollution laws (Groothuis and Miller, 1994).

International location factors

Many authors point out that only a limited amount of research has been reported on factors influence international location decisions for contemporary manufacturing operations (MacCarthy and Atthirawong, 2003; Siebert, 2006; Carod, 2005). The literature on International literature on industrial locations falls into two categories: empirical studies, and works developing theoretical concepts. Both strongly suggest that the long term investor in foreign countries realizes that reactions of host governments are likely to be very complex (Vernon, 1968, 1971). In addition to these authors, Tomback (1995) also suggest that location in an international context is a game of timing.

The theoretical literature on international industrial locations deals with identifying strategic issues within the context of integrated global strategies (Vernon, 1968 and Skinner, 1985). Some of these issues would be encountered in decision making involving domestic plant locations while others pertain only to foreign plant locations. The most common strategy issues deal with the risk of long term exchange rates, taxation laws and forms of investment.

International empirical studies mainly involve surveys of foreign plant managers, community leaders and other professional personnel familiar with international issues. In a survey of 118 plants operated by U.S. firms in Latin America, Europe and Asia, Bass, McGregor and Walters (1977) attempted to identify those factors that had guided management's decision to invest abroad. The main determinants identified in that study are: accessibility, basic services available, environment, site costs, industrialization, labor and staff availability, host taxes and incentives, area reputation, the nature of the host government and its policies.

Horst (1972) surveyed 1191 manufacturing corporations with foreign subsidiaries. He attempted to draw some inferences about the direct investment process by comparing the characteristics of firms investing in Canada with those not doing so, and of multinational firms with those which are solely domestic.

Another study which investigated firm and industry determinants, is that of Vernon (1971), who studied 187 U.S. manufacturing corporations with six or more foreign subsidiaries. He identified a set of factors important to these firms. Rummel and Heenan (1978) studied the process undertaken by multinationals to analyze political risk. Their study reveals a host of factors considered important in making international industrial location decisions. These factors include domestic instability, foreign conflict, political climate, and economic climate.

Other studies dealt with the disadvantages of locating abroad. Ballance (1987) analyzed the effect of incentives in location decisions. The study provides information on such incentives as cash grants, tax holidays, low interest loans and accelerated depreciation. He notes that firms considering only the financial advantages of locating in these areas may suffer negative consequences. The same views are reflected in an article that appeared in the Economist in 1979, which urges the consideration of political and social issues.

Little information is available on decisions that were beneficial, and which led to costly failures. The importance of non-economic aspects has not been systematically explored (Piper, 1971). Economic reasons, such as tax incentives, cost of operations, and sales growth are usually seen as paramount for a decision to locate abroad. Social and political factors may also be important; for example, multinational corporations may spread their risks by setting up manufacturing plants in different countries (Vernon, 1968, 1971 and Belli, 1970). Even personal reasons may dictate where a plant should be located abroad (Bass, McGragor and Walters, 1977).

More recent studies considered location as a vital dimension in corporate environmental strategies (Vastag et al., 1996). The demographic characteristics of the physical environment in which the firm operates are stressed. Other researchers went further to examine the fact that different location factors become important for those international firms investing in new manufacturing plants relative to those investing in mergers and acquisitions (Friedman, 1977).

Shove (1996) presented a policy framework in which he identified the effect of product-life-cycle and firm's size on location. He suggested that the spatial patterns of industrial location are a result of a product's input and competition conditions for each stage of its product cycle.

The emergence of "economic blocks", "unified markets", or "common markets" has brought about other dimensions of international location, where firms desire to be closer to one another (Venables, 1995; Engelstoft et al., 2003; Wood and Parr, 2005). Researchers stress that economic integration can change the incentives to locate in certain regions. Other researchers identify with the fact that such economic integration forces have dictated new rules for new location-decision maker (Yurimoto and Masui, 1995). Lindsay et al. (1995) and Young (1994) suggest that the international markets have become more open as a consequence of a reduction in local trade barriers. They suggest that the increased openness is likely to have profound implications for location decisions. Many others share such views (MacCarthy and Atthirawong, 2003; Somlev and Hoshimoto, 2005; Chan, 2005).

Recent studies of international location have stressed the importance of other factors related to political risk of such decisions (record of government stability; government structure; consistency of government policy; and attitude of government to inward investment). Many note that political risk is subject to a high degree of subjectivity as to the causative factors hence the difficulty in formulating a clear policy position (Annett, 2001; Smith-Hamilton and Omar, 2005).

Other recent studies have focused on the importance of socio-cultural factors. Many also note that socio-cultural differences are what shape location decisions. Cities and regions are competing to attract foreign direct investment and creative talents. In order to succeed they need to attach several new strings to their bows: diversified cultural offerings, quality of life and life style. Culture has become an important soft location factor and a key factor for boosting local and regional attractiveness. Based on a case study, the paper analyses the influence of "soft" location factors, in particular cultural activities, on the competitive position of producers located in different urban regions. The "cultural multiplier" approach is used to measure direct income flows resulting from such activities while the concept of externalities is employed to analyse the indirect effects (Dziembowska-Kowalska and Funk, 2000; Galan and Gonzalez-Benito, 2006).

Methodology

Identification of critical factors

Two hundred and five industrial location factors (detailed factors), including those derived from Table 1, were generated from the literature. Through a judgmental process of grouping similar factors, it was found that all could be classified into fourteen distinct categories. Together, these categories (or **critical factors**) define the important aspects of industrial location.

The process of identifying the fourteen critical factors utilized judgments by the authors and a group of industrial location professionals. After gathering the 205 detailed factors from the literature, these individuals grouped them into fourteen categories (critical factors) which were then used to guide development of individual items. This process resulted in an instrument strongly grounded in the literature.

Construction of measures of critical factors of industrial location

Rigorous methods are available for constructing instruments to measure social science variables (e.g., Nunnally, 1967; Sellitz et al., 1976 and Susman and Schutz, 1983). The process used in this study to develop measures of the critical factors of industrial location was based on generally accepted psychometric principles of instrument design.

In summary, the design process used in this study consists of nine steps. Steps 1 and 2 of the process, the literature review and the identification of the critical factors for industrial location, were discussed above. Steps 3, 4 and 5 -- initial selection of measurement items for each critical factor, pretesting of the instrument, and finalization of the measurement items-- were used to construct the measurement instrument (questionnaire) for the data collection step (step 6). In steps 7 and 8, internal consistency and detailed item analysis were used to construct measures for the critical factors. The final step involved evaluating the validity of the measures and the measurement instrument as a whole. The remainder of this section discusses steps 3,4 and 5; steps 6 through 9 are discussed in later sections.

Content validity

To establish content validity, the items for each factor were reviewed by professors and graduate students in operations management, economics and geography at the University of St. Louis in Missouri, University of Southern Mississippi and the University of Mississippi, in the United States, the University of Durham in the United Kingdom, and the United Arab Emirates University. After eliminating and reclassifying some items based on the review, the remaining items were subjected to a formal pretest involving thirty-five chief executives having responsibility for location decisions for various firms. During pretest interviews, the executives critiqued the items and provided suggestions to improve their wording. From the pretest and revision process, 100 measurement items remained (shown in Appendix A).

To measure the degree of importance of each item, a 5-point interval rating scale was used. For each critical factor, the actual level of importance can be represented by the average of the measurement item ratings for that factor. A vector of the averages for the fourteen factors can be used as a profile of the importance a firm attaches to that factor.

Samples and instrument administration

Since the primary objective of this research was to develop an instrument to measure a firm's perceptions of the importance of the fourteen critical factors in industrial location, executives at top levels in a firm were considered to be appropriate subjects. Therefore, high-level executives with responsibility for a firm's location were chosen as subjects. The Government of Dubai, in the United Arab Emirates provided the needed support of contacting the various foreign governments requesting their assistants. Each foreign government provided a list of firms operating in their territories. Moreover, each supplied a letter requesting the cooperation of these firms.

A total of 3241 firms (randomly selected) were contacted and asked to participate in the study. These firms were stratified by part of the world, and size [large (1) -- greater than 1,000 employees, large (2) -- 500 to 999 employees, medium (1) -- 200 to 499, medium (2) -- 100 to 199, small (1) -- 20 to 99, and small (2) -- less than 20 employees]. A total of 739 firms declined to participate; and 377 firms did not respond to the request. Scrutiny of the reasons for non-response and a regression analysis of average responses versus response time (Dicken and Lloyd, 1978) provided evidence of a lack of non-response bias.

Only upper level executives were asked to participate along with chief executive officers. They included senior managers of marketing, finance, production and personnel. It was left to the firms participating in the study to nominate their candidates. Executives meeting the study requirements were selected from the participating 2125 firms located in 23 countries. The total number of subjects was 6522. Larger firms provided multiple candidate names to participate in the study. As a result, for 23 percent of the firms there were multiple respondents. Table 2 provides a summary of subjects who participated in the study.

For maximum effectiveness in securing the data, on site data collection was performed. Since the Government of Dubai and an international consulting firm in the United Arab Emirates agreed to provide technical support and funding for the project, and for reasons of practicality, an air travel route was selected that encompassed the United States and the other 22 countries.

At each firm, the researchers met with the executives and briefed them about the nature and purpose of the study. The researchers were available at all times for any questions the participants might have as they completed the instrument. Each executive assessed the degree of importance of industrial location factors in his/her firm by rating each measurement item using the scale described in the previous section. Completed research instruments were immediately returned to the researchers. The researchers checked for any missing information and requested the participants to supply it. To ensure confidentiality, the researchers met with the participants individually. The personal contact approach produced a high participation rate by firms and executives.

Table 2: Participant characteristics

Characteristics	Number of firms participated	Number of firms contacted
Large (I)	307 (14.45%)	1038 (15.92%)
Large (II)	465 (21.88%)	1101 (16.88%)
Medium (I)	322 (15.15%)	1107 (16.97%)
Medium (II)	358 (16.85%)	1096 (16.80%)
Small (I)	336 (15.81%)	1044 (16.01%)
Small (II)	337 (15.86%)	1136 (17.42%)
United States & Canada	510 (24.00%)	1622 (24.85%)
Pacific Rim	491 (23.11%)	1548 (23.72%)
Europe	591 (27.81%)	1702 (26.08%)
Middle East & Africa	301 (14.16%)	996 (15.26%)
South America	232 (10.92%)	654 (10.02%)

Analysis and Results

Analysis of the critical factor measures

In this section, the reliability and detailed item analysis used to refine the measures of the critical factors contained in the instrument are described (Nunnally, 1967 and Sellitz, 1976). During the analysis, measurement items were evaluated and, if shown to detract from the reliability of the instrument, they were eliminated. The section concludes by describing the evaluation of the validity of the instrument.

Reliability

The two most general forms of reliability estimation were used to assess the reliability of the instrument, the internal consistency method, and the split half method (Nunnally, 1967). The internal consistency of a set of measurement items refers to the degree to which items in the set are homogeneous. Internal consistency can be estimated using a reliability coefficient such as Cronbach's alpha (Cronbach, 1951). Cronbach's alpha is computed for a scale based on a given set of items. It can be calculated for any subset of the items. It is, therefore, possible to identify the subset that has the highest reliability coefficient. The scale constructed from that subset is likely to be the best with regard to internal consistency.

An internal consistency analysis was performed separately for the items of each of the fourteen critical factors. The analysis revealed that it would require eliminating from 0 to 2 items for each factor in order to maximize the alpha coefficient r. Table 3 shows the original sets of measurement items associated with the fourteen factors, the items dropped from the original sets to achieve maximization of alpha, and the reliability coefficients associated with the resulting scales. The table shows the maximized reliability coefficients ranged from 0.7758 to 0.9618, indicating that some scales are more reliable than others. Typically, reliability rates of 0.7 or more are considered adequate (Nunnally, 1967 and Saraph et al., 1989).

The split-half approach was also employed to measure the reliability of the measurement instrument. In this approach, items within a test are divided in half and scores on the two half-test are correlated. The corrected correlation coefficient obtained is 0.8646, which provides more support for the reliability of the instrument.

Table 3: Internal Consistency of factors

Critical factor	Original item numbers	Number of items	Items deleted (by number)	Alpha
Transportation	1-9	9	9	0.7753
Labor	10-19	10	19	0.8483
Raw materials	20-24	5	None	0.9150
Market	25-36	12	None	0.8999
Industrial land	37-43	7	None	0.8936
Utilities	44-52	9	52	0.9322
Government Attitude	53-57	5	None	0.9217
Taxes	58-62	5	None	0.9618
Climate	63-66	4	None	0.8807
Community	67-77	11	69,70	0.8827
Political situation of foreign country	78-82	5	None	0.9218
Global competition and survival	83-86	4	None	0.9187
Government regulations	87-95	9	None	0.9174
Economic factors	96-100	5	None	0.9233

Detailed item analysis

To evaluate the assignment of items to the scales, Nunnally's method was employed. The method utilizes the correlation of each item with each scale. Specifically, the item-score to scale-score correlation's are used to determine if an item belongs to the scale as assigned, belongs to some other scale, or if it should be eliminated.

Following the revision provided by reliability analysis, as shown in Table 3, the remaining items were evaluated for assignment to scales. Table 4 shows the correlation matrix for the fourteen measures of the critical factors and the measurement items. Since Scale 1 (Transportation) is the average of items 1 to 9, the high correlation between Scale 1 and item 1 through 9 was expected. In addition, since item 1 to 9 showed relatively smaller correlations with the other scales, it was concluded that it had been assigned appropriately to Scale 1. All other items were similarly examined.

As shown in Table 4, all items have high correlations with the scales to which they were originally assigned relative to all other scales. Accordingly, it was concluded that all items had been appropriately assigned to scales. Since the detailed item analysis results were satisfactory on the first iteration, the items reported in Table 3, provide the final scale items.

Validity

The validity of a measure refers to the extent to which it measures what is intended to be measured (Nunnally, 1967). A measure has content validity if there is general agreement among the subjects and researchers that the instrument has measurement items that cover all aspects of the variable being measured. Content validity is judged by the researchers subjectively. Thus, the fourteen measures developed in this study have content validity since selection of measurement items was based on both an exhaustive search of the literature, and detailed evaluations by academicians and practicing top managers. Further, the pretest subjects (30 top executives) indicated that the content of each factor was well represented by the measurement employed.

A measure has construct validity if it measures the theoretical construct that it was designed to measure. The construct validity of each critical factor measure was evaluated by factor analyzing the measurement items of each. In this analysis (shown in Tables 5, 6 and 7), each measure was assumed to be a separate construct.

The factor matrices showed that they were unifactorial, except for the transportation and government regulations international items; that is, the items in twelve of the fourteen measures formed a single factor. This provides tentative evidence of construct validity for these fourteen factors.

In the case of the transportation factor, however, two factors emerged. As shown in Table 6, items number 4, 7 and 8, availability of trucking services, cost of raw material transportation and cost of finished goods transportation constituted a factor separate from the remainder of the transportation items. The remaining items formed another factor that can be interpreted as availability of transportation facilities.

In the case of international government regulations, two factors also emerged. As shown in Table 7, items 87, 88 and 91, clarity of corporate investment laws, regulations concerning joint ventures and mergers, and foreign ownership laws constituted a factor that was separate from the remainder of the international government regulation items.

These items can be interpreted as foreign investment and ownership laws. In future studies, consideration should be given to splitting the transportation items and international government regulation items, each, into two separate constructs.

Summary and conclusions

Researchers and others interested in the elements that motivate firms to locate in particular sites have been hampered by the lack of a comprehensive, validated instrument to help study and provide support for a firms' location decision. No previously published research has developed a comprehensive set of factors critical to the industrial location decision that span the literature. This paper describes a study that produces such an instrument. It identifies a set of fourteen critical factors of industrial location that have been synthesized from an extensive search of literature. The general critical factors of industrial location are transportation, labor, raw materials, markets, industrial sites, utilities, government attitude, tax structure, climate, and community. In addition, for international location considerations, four general factors are identified: political situation of foreign countries, global competition and survival, government regulations, and economic factors.

The process of identifying the fourteen critical factors utilized judgments by the authors and a group of industrial location professionals. After gathering two hundred and five detailed factors (or specific factors) from the literature, these individuals grouped them into fourteen categories, which were then used to guide development of individual items. A set of 100- detailed items were retained for further stringent psychometric analysis. Five detailed factors did not meet the criteria set for being "critical" or "important". These factors were availability of postal services, worker stability, adequacy of sewage facilities, availability of religious facilities, and availability of library facilities.

Qualitative discussion of location factors is common in literature. However, careful empirical work has been hindered by data scarcity. This paper used extensive data source to take a new look at the measurement list. For maximum effectiveness, executives meeting the study requirements were selected from 2125 firms located in 23 countries.

The instrument can be used to provide decision support in evaluating industrial location actions in either domestic or international contexts. The measures are empirically based, and proved to be reliable and valid. The reliability coefficients (alphas) of the measures ranged from 0.7758 to 0.9618. Further, systematic literature review and comprehensive pretesting helped ensure that the measures have content validity.

With the increasing globalization of business, the focus on international site location is intensifying, calling for more valid and accurate research to support the process. A crucial element in that process is a valid instrument for the critical factors involved in the location decision. The instrument developed in this study, with future refinements, could prove to be valuable to those involved in the process.

Table 4: Items to Scale Correlation Matrix

Factor	Item Number	Scale 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Transportation (Scale 1)															
	1	.78	.13	.56	.51	.48	.11	.15	.31	.12	.46	.49	.42	.31	.40
	2	.79	.23	.52	.57	.45	.21	.17	.27	.24	.43	.42	.43	.28	.31
	3	.70	.21	.43	.45	.31	.12	.11	.11	.20	.39	.32	.21	.11	.25
	4	.81	.34	.57	.61	.46	.15	.12	.25	.43	.45	.45	.24	.20	.35
	5	.82	.27	.46	.60	.52	.17	.22	.31	.18	.41	.52	.57	.32	.43
	6	.63	.15	.24	.12	.34	.09	.34	.38	.08	.29	.38	.45	.26	.18
	7	.75	.38	.65	.69	.28	.21	.13	.36	.11	.21	.25	.56	.37	.48
	8	.78	.42	.45	.70	.37	.19	.10	.41	.10	.25	.31	.61	.42	.41
Labor (Scale 2)															
	10	.54	.81	.12	.49	.21	.07	.16	.28	.31	.35	.33	.42	.21	.49
	11	.43	.76	.43	.53	.19	.34	.19	.47	.21	.27	.19	.54	.38	.59
	12	.52	.80	.11	.45	.20	.10	.14	.25	.36	.31	.26	.39	.19	.40
	13	.15	.65	.25	.54	.17	.28	.57	.37	.22	.46	.43	.51	.50	.57
	14	.29	.68	.10	.49	.19	.11	.25	.14	.31	.43	.24	.47	.25	.39
	15	.13	.63	.15	.26	.16	.16	.19	.08	.33	.29	.15	.45	.23	.39
	16	.41	.78	.10	.43	.12	.12	.23	.18	.32	.28	.24	.41	.24	.41
	17	.45	.73	.07	.40	.19	.13	.24	.11	.28	.22	.18	.44	.21	.44
	18	.57	.64	.15	.54	.35	.38	.17	.23	.45	.44	.19	.50	.17	.58
Raw Materials (Scale 3)															
	20	.61	.42	.86	.43	.53	.17	.33	.25	.22	.31	.38	.57	.44	.48
	21	.67	.44	.76	.46	.57	.21	.19	.21	.23	.29	.32	.59	.23	.38
	22	.65	.47	.71	.46	.59	.34	.17	.22	.46	.36	.14	.13	.19	.26
	23	.59	.30	.70	.54	.60	.13	.11	.16	.35	.28	.37	.55	.26	.54
	24	.67	.50	.74	.57	.34	.18	.15	.20	.19	.20	.42	.62	.21	.56
Markets (Scale 4)															
	25	.52	.37	.43	.77	.38	.23	.22	.20	.31	.45	.20	.55	.18	.55
	26	.57	.31	.58	.75	.64	.21	.27	.18	.36	.41	.38	.51	.23	.52
	27	.50	.35	.46	.72	.41	.28	.31	.26	.22	.51	.41	.57	.16	.63
	28	.67	.33	.37	.73	.55	.20	.27	.33	.23	.32	.34	.50	.36	.62
	29	.42	.28	.16	.66	.46	.16	.32	.11	.19	.53	.12	.43.	.20	.40
	30	.46	.33	.27	.72	.51	.20	.36	.23	.17	.48	.52	.62	.21	.64
	31	.31	.45	.22	.66	.32	.24	.29	.30	.21	.46	.44	.45	.32	.32
	32	.34	.42	.18	.69	.38	.34	.34	.43	.23	.44	.34	.50	.10	.46
	33	.33	.44	.27	.68	.37	.25	.20	.31	.32	.36	.27	.39	.35	.32
	34	.40	.38	.28	.71	.47	.12	.23	.20	.17	.34	.35	.64	.24	.50
	35	.52	.22	.46	.66	.63	.31	.33	.39	.36	.40	.50	.63	.49	.54
	36	.56	.31	.32	.82	.54	.20	.35	.22	.39	.27	.34	.65	.37	.63
Industrial Site (Scale 5)															
	37	.33	.23	.20	.33	.77	.54	.23	.50	.22	.24	.13	.34	.23	.32
	38	.30	.22	.21	.34	.76	.51	.21	.54	.21	.23	.14	.32	.23	.27
	39	.30	.21	.24	.35	.71	.46	.31	.32	.18	.21	.18	.27	.28	.21
	40	.44	.17	.22	.28	.72	.33	.23	.26	.17	.27	.20	.35	.24	.46
	41	.23	.25	.21	.21	.63	.42	.36	.46	.23	.32	.23	.42	.19	.45
	42	.20	.20	.25	.43	.63	.44	.41	.43	.14	.25	.15	.37	.27	.53
	43	.45	.18	.21	.51	.65	.30	.19	.22	.16	.32	.21	.40	.30	.42
Utilities (Scale 6)															
	44	.23	.21	.53	.26	.54	.70	.23	.29	.34	.55	.15	.42	.41	.43
	45	.31	.23	.51	.21	.61	.73	.26	.19	.42	.43	.18	.38	.43	.48
	46	.54	.24	.60	.19	.32	.69	.24	.35	.29	.39	.12	.46	.36	.41
	47	.57	.18	.63	.20	.55	.64	.46	.21	.41	.32	.43	.37	.43	.40
	48	.57	.23	.64	.23	.43	.75	.35	.27	.24	.28	.27	.47	.34	.53
	49	.39	.16	.60	.18	.40	.71	.32	.39	.29	.34	.31	.51	.42	.56
	50	.24	.19	.59	.15	.43	.76	.20	.24	.46	.27	.18	.45	.29	.51
	51	.25	.22	.64	.16	.46	.78	.16	.41	.44	.34	.23	.43	.30	.55

Table 4 (continued). Items to Scale Correlation Matrix

Factor	Item Number	Scale 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Government Attitude (Scale 7)															
	53	.57	.17	.21	.22	.58	.26	.67	.23	.24	.42	.28	.18	.57	.25
	54	.21	.15	.17	.25	.32	.22	.72	.45	.20	.32	.43	.42	.55	.43
	55	.32	.32	.12	.23	.28	.24	.68	.48	.37	.30	.46	.39	.58	.51
	56	.20	.11	.23	.24	.33	.22	.74	.21	.24	.18	.21	.20	.61	.14
	57	.47	.14	.26	.12	.45	.14	.77	.13	.44	.41	.27	.40	.66	.38
Tax structure (Scale 8)															
	58	.33	.44	.50	.23	.22	.43	.32	.87	.11	.23	.33	.40	.43	.65
	59	.37	.31	.54	.20	.54	.42	.29	.76	.18	.21	.30	.43	.55	.43
	60	.21	.42	.34	.29	.43	.32	.46	.77	.14	.24	.25	.36	.52	.36
	61	.40	.54	.51	.21	.30	.28	.32	.79	.10	.17	.26	.69	.65	.66
	62	.31	.32	.32	.30	.32	.21	.49	.69	.20	.26	.35	.63	.63	.65
Climate (Scale 9)															
	63	.40	.54	.31	.44	.43	.46	.23	.40	.66	.62	.45	.60	.28	.63
	64	.39	.27	.24	.36	.21	.56	.20	.32	.78	.34	.15	.35	.23	.39
	65	.42	.24	.20	.31	.22	.54	.16	.28	.85	.31	.19	.36	.20	.41
	66	.29	.30	.25	.23	.47	.53	.35	.17	.65	.40	.23	.29	.31	.37
Community (Scale 10)															
	67	.55	.58	.21	.49	.46	.20	.43	.37	.55	.69	.41	.44	.39	.35
	68	.53	.55	.18	.58	.45	.28	.39	.42	.49	.68	.24	.41	.45	.29
	71	.47	.35	.15	.56	.52	.32	.20	.21	.64	.71	.20	.23	.32	.21
	72	.32	.42	.17	.39	.43	.24	.54	.43	.35	.75	.24	.27	.34	.43
	73	.35	.34	.11	.35	.55	.31	.32	.33	.29	.70	.19	.31	.26	.32
	74	.51	.38	.23	.63	.52	.23	.36	.29	.65	.72	.32	.33	.23	.39
	75	.46	.34	.13	.57	.41	.19	.54	.46	.61	.68	.23	.26	.33	.34
	76	.21	.20	.28	.46	.57	.23	.62	.57	.23	.66	.28	.22	.46	.63
	77	.46	.31	.23	.50	.30	.24	.68	.49	.27	.76	.54	.25	.57	.64
Political situation of foreign country (Scale 11)															
	78	.43	.46	.33	.41	.26	.33	.64	.55	.11	.42	.79	.72	.54	.65
	79	.29	.43	.31	.45	.24	.20	.65	.59	.10	.44	.71	.67	.66	.64
	80	.53	.45	.24	.32	.23	.45	.69	.43	.13	.43	.85	.57	.54	.60
	81	.34	.28	.31	.33	.21	.34	.58	.51	.12	.50	.87	.56	.58	.52
	82	.32	.26	.32	.21	.43	.21	.69	.57	.17	.37	.73	.64	.53	.66
Global competition and survival (Scale 12)															
	83	.69	.70	.68	.57	.45	.25	.34	.47	.39	.51	.68	.74	.57	.64
	84	.68	.37	.45	.72	.43	.29	.27	.48	.35	.40	.67	.75	.54	.70
	85	.68	.45	.46	.57	.46	.23	.24	.60	.41	.34	.61	.69	.65	.59
	86	.59	.54	.59	.74	.41	.31	.29	.55	.36	.29	.51	.77	.39	.58
Government regulations (Scale 13)															
	87	.29	.28	.22	.35	.53	.21	.65	.56	.23	.32	.43	.59	.75	.64
	88	.23	.24	.19	.39	.42	.14	.61	.61	.22	.25	.42	.54	.73	.67
	89	.36	.23	.25	.29	.26	.11	.64	.65	.23	.33	.56	.55	.77	.60
	90	.32	.28	.24	.23	.55	.19	.60	.69	.28	.22	.61	.56	.73	.65
	91	.38	.19	.15	.21	.46	.21	.62	.62	.11	.25	.54	.57	.69	.64
	92	.34	.61	.23	.32	.37	.25	.63	.61	.19	.24	.51	.49	.68	.67
	93	.52	.32	.47	.29	.31	.22	.61	.55	.20	.22	.60	.52	.69	.59
	94	.32	.27	.23	.31	.33	.27	.65	.64	.21	.46	.63	.54	.69	.63
	95	.24	.25	.20	.30	.37	.24	.60	.59	.23	.42	.58	.52	.68	.61
Economic factors (Scale 14)															
	96	.24	.45	.14	.59	.20	.44	.13	.47	.41	.65	.44	.60	.31	.72
	97	.25	.68	.23	.56	.23	.43	.19	.44	.43	.56	.46	.54	.29	.76
	98	.29	.54	.19	.54	.13	.32	.46	.60	.14	.28	.45	.56	.43	.69
	99	.19	.43	.20	.45	.18	.28	.51	.40	.11	.41	.44	.68	.36	.75
	100	.28	.39	.11	.33	.20	.49	.66	.39	.20	.44	.39	.47	.49 . 69	

Table 5: Item loading ranges for factor 1

Construct	Item Loading Range for Factor 1	Eigenvalues
1	0.46 to 0.70	6.1
2	0.55 to 0.87	7.2
3	0.67 to 0.85	2.4
4	0.66 to 0.79	6.4
5	0.55 to 0.80	2.8
6	0.46 to 0.81	4.7
7	0.72 to 0.82	4.3
8	0.83 to 0.89	3.0
9	0.53 to 0.67	2.4
10	0.67 to 0.78	7.2
11	0.65 to 0.67	4.3
12	0.54 to 0.64	8.3
13	0.53 to 0.77	9.1
14	0.48 to 0.81	8.5

Table 6. Factor matrix for Transportation

Item Number	Factor 1	Factor 2
1	0.70	
2	0.46	
3	0.57	
4		0.61
5	0.61	
6	0.47	
7		0.71
8		0.69
Eigenvalue	6.1	2.3
% variance explained	58	31

Table 7: Factor matrix for International government regulation

Item Number	Factor 1	Factor 2
87		0.74
88		0.61
89	0.77	
90	0.75	
91		0.79
92	0.53	
93	0.66	
94	0.55	
95	0.69	
Eigenvalue	9.1	2.1
% variance explained	59	34

Researchers can use the instrument to conduct studies about the process behind industrial location decisions in which the results will be comparable **across** studies. Further, using the instrument to build an empirical data base of comparable data will assist researchers in developing and testing theories in the area. Researchers can use the

measures to develop theory and decision models to further research in the area and increase understanding of the decision process itself.

For state and government legislators and administrative officials, the implications of better understanding the status the site selection factors are clear. If the attraction of foreign direct investment is a goal, then providing for the essential needs of those firms is necessary. The instrument developed in this study provides the checklist to facilitate the job of those officials in assessing the adequacy of their offerings and in initiating strategic plans for better competitive advantage. The ability of a country to provide the "right combination" that allows a company to achieve a competitive advantage operationally, is, of course, paramount. Countries that cannot offer operational advantages are quickly eliminated from further consideration. Some officials are often not aware of the specific needs (factors of location) desired by industrial or non-industrial plants. The availability of a scientifically valid and reliable instrument of the factors of location can, without doubt, offer a better mean to understand the variables of location. In other words, communities can exert a positive volitional bargaining force to attract new industry by attempting to increase the attractive power of their communities (factors of location).

The implications of site selection factor list developed in this study are fairly straight forward for managers of foreign companies contemplating manufacturing operations overseas. These managers can use the developed checklist to better compare the different site alternatives available to them. The list incorporates both specific questions and topics for more general discussions. For corporate decision-makers, decision support systems can be developed to incorporate the identified measures, thus providing effective location decision aids. An absolute requirement for the development of any effective decision support system is the identification of valid and reliable factors. In pursuit of that goal, this study resulted in the identification of fourteen critical dimensions of location planning and action. These psychometrically determined "critical factors" are those that should be evaluated by decision-makers in order to reach a sound industrial location decision.

In summary, firms using the instrument should be able to obtain a better understanding of the location decision-making process. The instrument can assist decision-makers in "what if" comparisons of different locations and in comparisons by types of firms by prioritizing industrial location factors for each firm. In addition, for those communities, cities, states, etc., whose development strategies involve attracting firms to their sites, the application of the instrument can provide valuable marketing information concerning the location values of interested firms.

The results concerning the measures developed in this study are encouraging but a great deal of further research remains to be done. Replications of the empirical work reported here are needed to corroborate these results. Studies are needed that involve more modern-emerging items. The authors hope that this study will provide impetus for further research aimed at gaining a better understanding of the process of industrial location.

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APPENDIX A

This appendix contains the items in the original research instrument. The items noted by an asterisk (*) were eventually dropped to improve the reliability of the instrument.

No.	Critical Factors	No.	Critical Factors
	Factor 1: Transportation		**Factor 5: Industrial site**
1	Availability of airway facilities.	37	Cost of industrial land.
2	Availability of highway facilities.	38	Cost of developed industrial park.
3	Availability of railroad facilities.	39	Acreage required.
4	Availability of trucking services.	40	Availability of space for future expansion.
5	Availability of water transportation.	41	Insurance rates.
6	Availability of pipeline facilities.	42	Availability of lending institutions.
7	Cost of raw material transportation.	43	Closeness to other industries.
8	Cost of finished goods transportation.		
9*	Availability of postal services.		**Factor 6: Utilities**
		44	Adequacy of water supply.
	Factor 2: Labor	45	Quality of water supply.
10	Availability of skilled labor.	46	Cost of water supply.
11	Amount of Wage rates.	47	Availability of disposable facilities for industrial waste.
12	Availability of unskilled labor.		
13	Nonexistence of unions.	48	Availability of fuels.
14	Educational level of labor.	49	Cost of fuels.
15	Dependability of labor.	50	Availability of electric power.
16	Availability of male labor.	51	Cost of electric power.
17	Availability of female labor.	52*	Adequacy of sewage facilities.
18	Cost of living (housing).		
19*	Worker stability.		**Factor 7: Government attitude**
		53	Zoning codes.
	Factor 3: Raw materials	54	Compensation laws.
20	Availability of raw materials and components.	55	Insurance laws.
21	Closeness to materials and components.	56	Safety inspections.
22	Availability of storage facilities for materials and components.	57	Nuisance and stream pollution laws.
23	Location of suppliers.		**Factor 8: Tax structure**
24	Freight cost.	58	Tax assessment basis.
	Factor 4: Markets	59	Industrial property tax rates.
25	Proximity to consumer good markets.	60	State corporate tax structure.
26	Proximity to producer goods markets.	61	Availability of tax free operations.
27	Anticipation of growth of markets.	62	State sales tax.
28	Shipping costs to market areas.		
29	Availability of marketing services.		**Factor 9: Climate**
30	Attainment of favorable competitive position.	63	Living conditions
31	Income trends.	64	Relative humidity
32	Population trends.	65	Monthly average temperature.
33	Consumer characteristics.	66	Air pollution.
34	Location of competitors.		
35	Future expansion opportunities.		
36	Size of markets.		

No.	Critical Factors	No.	Critical Factors
	Factor 10: Community		**Factor 13: Government regulations**
67	Availability of colleges.	87	Clarity of corporate investment laws.
68	Availability of schools.	88	Regulations concerning joint ventures and mergers.
69*	Religious facilities.		
70*	Library facilities.	89	Regulations on transfer of earnings out of country.
71	Availability of recreational facilities.		
72	Attitude of community leaders.	90	Taxation of foreign owned companies.
73	Availability and quality of medical facilities.	91	Foreign ownership laws.
74	Availability and quality of shopping centers.	92	Allowances on the percentage of employees that may be foreign.
75	Availability of hotels.		
76	Availability of banks and credit institutions.	93	Prevalence bureaucratic red tape.
77	Community position of future expansions.	94	Restrictions of price controls.
		95	Requirements for setting up local corporations.
	Factor 11: Political situation of foreign country.		**Factor 14: Economic factors**
78	Stability of regime.	96	Standard of living.
79	Protection against expropriation.	97	Per capita income.
80	Type of treaties or pacts.	98	Strength of currency against US dollar.
81	Military alliances.	99	Balance of payments status.
82	Attitude of government toward foreign capital.	100	Type of government aids.
	Factor 12: Global competition and survival		
83	Availability of material and labor.		
84	Market opportunities.		
85	Availability of capital.		
86	Proximity to international markets.		