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# A COGNITIVE PERSPECTIVE OF DECISION MAKING IN ACQUISITION PROGRAMS:

## INSIGHTS FROM THE HIGH TECHNOLOGY INDUSTRY

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### ✓ A B S T R A C T

This paper explores the strategy formulation and the concepts related to decision making regarding acquisition formation in the information technology industry. Acquisitions, as part of the technical collaboration between firms in the information technology industry, have been intensive since 1990. The complexity of the related issues, critical success factors, conditions, triggers, motivations, causes, effects and their interlinked relationships, have not been fully covered in the literature of strategic management. In this paper, they are explored with a holistic approach to the study of strategic management, using a cause and effect mapping technique, known as cognitive mapping. The application of this research tool and the results help us to understand the importance of each concept (causes and consequences) used, the interrelationships between them, and the complexity of the decision making process. The paper is a contribution to the field of strategic management and to the cognitive approach in the management science.

### INTRODUCTION

The information technology industry is different than any other technology based industry. It is characterized by turbulence, high velocity, uncertainty and complexity. This is due partially to the high rate of innovation, obsolescence, intensity of R&D activities and the continuous emergence of disruptive technologies. The IT industry is based on knowledge intensive content, which is not codified in routines and procedures, tacit in nature, and embedded in the social complexity of the interrelation between the agents' interactions. Firms in the IT sector, possess highly technical skills, intensive R&D capabilities, entrepreneurial management experience, and healthy organizational structure and culture that encourage innovation and creativity, all of which are considered as strategic assets which are difficult to imitate, unique, copy, duplicate or simply transfer by employees mobility, recruitment or retention. Those strategic assets are built over time, based on choice and path dependency, and constitute the core competencies of the firm providing a sustained competitive advantage.

The information technology industry has witnessed intensive collaborative activities between the firms in the sector, aimed at coping with the environmental challenges, need for continuous innovation and scarcity of strategic resources and talents. Those collaborative activities included informal collaboration, strategic alliances, R&D agreement, joint-ventures, venture capital, angel investment, mergers and acquisitions. Since 1990, mergers and acquisitions for example have been used intensively by information technology firms for different reasons. Beside traditional motivations of economizing and empire building, IT firms used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost of R&D, expand its portfolio of products, reduce product time to market and provide for an external source of continuous innovation. Several firms have used acquisitions as their main growth strategy. Cisco systems for example, a high technology Silicon Valley based company working in the manufacturing of networking and telecommunications equipment and software, acquired more than 107 companies during the period from 1993 to 2006. In the year 1999 alone it acquired 18 companies and in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month. Today, Cisco systems stands as a leader in the high technology

industry and as the company which created this trend of using a successful aggressive acquisition strategy as its main growth engine; a strategy later called "acquisition and development" or A&D.

However, the importance of this trend within the context of the high technology industry, the research on acquisitions in the literature of strategic management could be categorized as contradictory, incoherent and incomplete. First, it is contradictory because the findings present contradictory performance outcome related to acquisitions, even in the same industry sector. Second, it is incoherent, because some researches focus on the economic aspect of acquisitions including performance, economies of scope and scale, market penetration, growth, position, net gain, etc., while the others focus on the strategic aspect of acquisition including human talent, tacit knowledge, strategic resources, strategic fit, organizational culture and core competencies. Each approach neglects the other, which leads to an incoherent picture of the factors involved. The theories used are numerous: transaction cost economics, resource based view, market based view, knowledge based view, institutional theory, network theory, population ecology, among others. Each theory gives a perspective to the study of acquisitions, however the whole picture remains fragmented and unclear. Third, it is incomplete because the literature has not shed enough light on all the factors, criteria, conditions, motivations, causes and consequences related to the acquisition formation. When a company such as Cisco undergoes intensive acquisition activities during a small period of time (*two per month*), the critical success factors and the process of decision making for the acquisition formation has not been fully researched, under those extreme and intense environmental conditions. In fact due to its complexity, most of the factors and the whole process is researched using cognitive simplification (*Duhaime et al., 1985*), implying also that practitioners use simplification in their decision making. Furthermore, practical considerations limit the research on complex issues. In quantitative research studying acquisitions, the practical limitation on the number of variables to be used, limit the research to those variables, and does not explain the "why" and "how" related questions. Using industrial and commercial databases and conducting statistical analysis using multiple techniques, does not clarify, nor explain the factors and their interrelations related

to acquisitions. In qualitative acquisitions research, the textual form provides more clarification and explanation, but is constrained by the limited number of pages required for publishing a paper. Moreover, as the field of strategy and strategic management borrows from different disciplines such as sociology, anthropology, politics, industrial economics, etc., acquisitions research using one or another perspective, remain fragmented, does not integrate all of the factors involved and does not portray the complexity of the issue (Hasfi *et al.*, 2005).

Therefore, there is a gap in the strategic management literature with respect to the research on acquisitions in the context of the high technology industry. This paper provides a valuable contribution in filling this gap. The paper uses a holistic and integrative approach in researching acquisitions in the context of the high technology industry, by integrating and combining different and distinct perspectives into a larger model, while maintaining the depth of analysis that could be used in an analytical approach, without neglecting the details, coherence and the relation to practice. The objective of this research is to highlight the concepts related to acquisitions in the context of the high technology industry and their relative importance in the process of decision making leading to the acquisition formation. The concepts have been gathered from the strategic management literature, classified according to their respective theoretical approach and their interrelated links examined using triangulation to ensure internal validity. A causal mapping technique known as cognitive mapping, was used to draw the causal and effect relationships between the different concepts and to analyze their interrelated effects on each other and their relative importance with a constructivist, holistic and integrative model. The constructed map eliminates the limitations of the traditional statistical methods used in quantitative research and the textual methods used in qualitative research, by providing a visual tool for combining a large number of concepts in one space, including their interrelated links describing a causal or effect relationship. It is a representation of cognitive schema based on my understanding of the literature on acquisitions in the strategic management tradition. The research is a contribution to the field of strategic management, to the research on acquisitions in the context of the high technology industry and to the application of the cognitive approach in studying management issues using the cognitive mapping as a research tool. The research is intended to both academia and practitioners.

## 1. Theoretical Background

The research on acquisitions in the context of the high technology industry is a complex issue and it is much more complex than it seems, when using one approach. As noted by Hafsi and Thomas (2005, p 509) “collective action cannot be understood if it is broken down into parts to be stud-

ied separately. As reality is complex, it is more appropriate to study it in its totality. This means not only studying all the parts together but also their inter-relationships, even if the result is an incomplete and imperfect understanding”. Strategy is classified into divisional functions such as marketing, finance, operations; it is grounded in behavioral science, political science, anthropology, sociology, psychology, economics and finance, it combines different disciplines such as business policy and strategic management, industrial organization, organizational economics, economics sociology, human behavioral science, organizational theory, it uses different theories borrowed from distinct areas of social science such as transaction cost, resource based view, network theory, knowledge-based view and market-based view. “ It feels like a vast array of diverse and uncoordinated detailed observations that are scientifically respectable, yet incoherent in practice” (Hasfi *et al.*, 2005, p 511). Therefore the need for an integrative and holistic approach that encompasses as many variables as possible, constructing the reality as observed by the researcher, and painting a realistic picture of the reality using a constructivist approach.

The complexity of the research on acquisitions has led to the use of cognitive simplification by both academic researchers and practitioners. Decision makers use similarities and analogies to similar situations and they overestimate or underestimate the potential impact of their decisions due to the limited number of factors used in the analysis (Duhaime *et al.*, 1985). Cognitive simplification is demonstrated to be widely used in the process of decision making and when dealing with complex and interrelated issues (Schwenk, 1984). Bounded rationality is the inability of the human to process more than a limited number of alternatives and to process them all, which limits his ability to solve complex problems (March *et al.*, 1958; Simon, 1976). Under those limitations and facing complex issues, the process of decision making was researched in the context of structuring the unstructured (Mintzberg *et al.*, 1976), making judgment under uncertainty (Tversky *et al.*, 1974), and the psychological determinants of bounded rationality and its implications for decision making (Taylor, 1975). The cognitive complexity in the strategic decision process has been explored by Hitt and Tyler (1991b). Also Tyler and Steensma (1995) explored the technological collaborative activities using a cognitive perspective: “The cognitive limitations affect the simplified mental models or schema top executives use to get a grasp of the situation at hand” (Schwenk, 1984; Walsh, 1995) as cited by Tyler and Steensma (1995). Finally Eisenhardt and Zbaracki (1992) provides an extensive comparison between bounded rationality, power and politics and the garbage can model.

Cognitive mapping is used to represent the mental schema of the researcher when studying an issue (Eden *et al.*, 1998) or as a representation of the representation of the mental schema of a human subject related to a research issue (Cossette *et al.*, 1994). They are constructed based on a subjectivist approach, by using concepts or variables relat-

ed to the issue under investigation and links or relations between the concepts reflecting their interrelations, strength and directions. Cognitive maps help to uncover the knowledge structure and the dominant logic within the firm related to the subject under investigation (Bettis *et al.*, 1995b). It assist in giving meaning and signification, or sense giving, to the issues related to a central concept, question, vision or strategy (Gioia *et al.*, 1991).

Cognitive mapping techniques have been used in different areas of the administrative science and for different purposes. Some examples include: mapping conceptual models in macroeconomic theory (Cossette *et al.*, 1997); analyzing the thinking of F. W. Taylor (Cossette, 2002); supporting information system development (Ackermann *et al.*, 2005); analysing policies in the public sector (Eden *et al.*, 2004); analyzing retail location decision making (Clarke *et al.*, 2003); analyzing technology driven and model driven approaches to group decision (Morton *et al.*, 2003); analyzing delay and disruption (Williams *et al.*, 2003); analyzing the institutional influences on managers’ mental models of competition (Daniels *et al.*, 2002).

## 2. Methodological Framework

The research used the cognitive mapping technique as a qualitative research tool for analyzing qualitative data. The cognitive mapping technique was used with the aid of the software package ‘Decision Explorer’, which allows for the introduction of the data collected, and the subsequent analysis based on the produced output in the form of quantitative data and graphic maps.

The data collection was based on the literature on strategic management related to acquisitions. Using the ProQuest and JSTOR databases, more than 80 articles from top management journal covering acquisitions were identified and carefully reviewed. Only 56 articles, where the main objective was to study acquisitions’ motivations, impact and critical success factors, were chosen as pertinent to the research subject. Articles covered different theories and used different research methodologies: Qualitative and quantitative. They were studied thoroughly in search for concepts related to acquisitions. Some articles were eliminated because the constructs were poorly defined. The collected data was classified into (1) motivation or trigger (*causes*); (2) impact (*consequence*); and (3) critical success factor. A total of

85 concepts were found. After preparing a list of concepts, all the concepts were checked against each other to eliminate duplication and to ensure that each concept is unique and well defined on its own term and distinct from another, which ensures the construct validity (Lincoln *et al.*, 1985). A final number of 74 concepts were selected with their respective links to other concepts as described in the literature.

Each concept was analyzed using source and theory triangulation methods to ensure the validity of the construct and its agreement on the same definition of the concept, and its links. This ensures the credibility, internal validity and reliability if another researcher decides to embark on analyzing the same subject. After analyzing each concept, its relationships in term of causal link or consequential link with other concept were analyzed. Direct and indirect relationships were also analyzed. No overlap between direct and indirect relationships was allowed, unless specified in the literature explicitly. Triangulation of sources was also used in this regard. In the list of concepts (*table 1*), and for reliability and auditing purposes, each concept was provided with a list of all citations from which it was drawn and applied in the model. In addition, only links described in the literature were listed, with their citation references. All citations are included in the bibliography.

The map of concept and links (*figure 1*), or cognitive map, was drawn using the software tool “Decision Explorer” from Banxia Software Company ([www.banxia.com](http://www.banxia.com)). After drawing the map, several revisions were made on the relationships between the concepts. Few links were added, within the spirit of my understanding of the literature regarding acquisitions, although not found explicitly in the literature. The added links were verified against common sense and did not contradict the literature in any way. **Table 1** describes the list of the 74 selected concepts, with their references and related links that were only found in the literature. **Table 2** describes the list of positive and negative links for each concept as drawn in the cognitive map, which includes the links found in the literature and the links that were not explicitly found but added for common sense.

**Figure 2** illustrates the functional cognitive decision groups based on which acquisition decision is analyzed and reached. It suggests that multidisciplinary teams from different organizational departments within the acquiring organization, are working together to formulate the strategy for the acquisition program based on various dimensions and their embedded variables such as



Concept / Construct / Variable		Concept cited by	Related concepts	Link cited by
1	Competitive advantage	(Porter, 1980) (Prahalad et al., 1994) (Oliver, 1997)		
2	Synergy	(Brush, 1996) (James et al., 1998) (Walter et al., 1990) (Chatterjee, 1986) (Lubatkin, 1983) (Wernerfelt, 1984)	49, 17, 50, 51, 52, 37	(Brush, 1996) (James et al., 1998)
3	Market power	(Galbraith et al., 1984)	17, 54	(Galbraith et al., 1984) (Trautwein, 1990)
4	Complexity	(Jemison et al., 1986)		
5	Barriers to entry	(Yip, 1982) (Wernerfelt, 1984)	58	(Yip, 1982)
6	Cost	(Walter et al., 1990)		
7	Firm's size			
8	Incentives	(Paine et al., 1984)		
9	Talent retention	(Mayer et al., 2004) (Cannella et al., 1993) (Coff, 1997)		
10	Absorptive capacity	(Hoffman et al., 2001)		
11	R&D cost	(Roberts et al., 2001)		
12	Degree of integration	(James et al., 1998) (Paine et al., 1984) (Mayer et al., 2004) (Jemison et al., 1986) (Nahavandi et al., 1988)	51, 17,	(James et al., 1998)
13	Management control	(Eisenhardt, 1989)	63	(Hitt et al., 1991a)
14	Increase economies of scale	(Duysters et al., 2003) (Walter et al., 1990) (Hoffman et al., 2001) (Singh et al., 1987)	17	
15	Increase economies of scope	(Hoffman et al., 2001) (Lubatkin, 1983) (Singh et al., 1987)		
16	Increase core competencies	(Hitt et al., 1991a) (Prahalad et al., 1990) (Prahalad et al., 1994) (Quelin, 2000) (Singh et al., 1987)	17	(Hitt et al., 1991a)
17	Acquisition formation	(Feeser et al., 1990) (Shelton, 1988) (Brush, 1996) (Galbraith et al., 1984) (Hopkins, 1987)	48, 45, 2, 3, 46, 62, 60	(Shelton, 1988) (Brush, 1996) (Galbraith et al., 1984) (Haleblian et al., 1999) (Hitt et al., 1991a)
18	Trust	(Eisenhardt, 1989) (Williamson, 1975) (Jemison et al., 1986) (Williamson, 1999)		
19	Danger of appropriation	(Hoffman et al., 2001)	17	
20	Moral hazard	(Eisenhardt, 1989) (Hoffman et al., 2001) (Coff, 1997)		
21	Degree of opportunism	(Eisenhardt, 1989) (Williamson, 1975) (Hoffman et al., 2001; Williamson, 1999)	28	(Eisenhardt, 1989)
22	Bounded rationality	(Eisenhardt, 1989) (Williamson, 1975) (Williamson, 1999) (Coff, 1997)		
23	Resource dependency	(Pfeffer, 1972)	17	(Pfeffer, 1972)
24	Asset specificity	(Hoffman et al., 2001) (Williamson, 1975) (Williamson, 1999) (Oliver, 1997) (Coff, 1997) (Robertson et al., 1998)		
25	Path dependency	(Oliver, 1997) (Singh et al., 1987)		
26	Tacit knowledge	(Oliver, 1997)		
27	Technical complexity	(Bettis et al., 1995a)		
28	Information asymmetry	(Eisenhardt, 1989) (Hoffman et al., 2001) (Coff, 1997)	21	(Eisenhardt, 1989)
29	Uncertainty	(Quelin, 2000) (Roberts et al., 2001) (Hoffman et al., 2001) (Bettis et al., 1995a)		
30	Technological uncertainty	(Quelin, 2000) (Roberts et al., 2001) (Robertson et al., 1998; Walker et al., 1984)		
31	Market uncertainty	(Quelin, 2000) (Roberts et al., 2001) (Robertson et al., 1998)		
32	Product uncertainty	(Quelin, 2000) (Roberts et al., 2001)		
33	Proximity	(Ferrary, 2003) (Mayer et al., 2004)		
34	Degree of modularity	(Gawer et al., 2002)		

TABLE 1. Concept description, references and related links

Concept / Construct / Variable		Concept cited by	Related concepts	Link cited by
35	Platform leadership	(Gawer et al., 2002)		
36	Economic performance	(Lubatkin, 1983) (Singh et al., 1987)		
37	Technological performance	(James et al., 1998)		
38	Complementary product / technology	(Shelton, 1988) (Mayer et al., 2004) (Wernerfelt, 1984)	45	(Shelton, 1988)
39	Supplementary product / technology	(Shelton, 1988) (Wernerfelt, 1984)	45	(Shelton, 1988)
40	Substitute product / technology	(Gawer et al., 2002)	58,	
41	Degree of product relatedness	(Feeser et al., 1990) (Hopkins, 1987) (James et al., 1998) (Roberts et al., 2001) (Wernerfelt, 1984)	48, 17, 58	(Feeser et al., 1990)
42	Compatible organizational culture	(Jemison et al., 1986) (Mayer et al., 2004) (Datta, 1991) (Nahavandi et al., 1988)		
43	Compatible organizational objectives / strategy	(Mayer et al., 2004)		
44	Level of strategic asset	(Hagedoorn et al., 2002) (Oliver, 1997) (Peteraf, 1993)	17	
45	Strategic fit	(Shelton, 1988) (Paine et al., 1984) (Mayer et al., 2004) (Jemison et al., 1986) (Wernerfelt, 1984)	38, 39, 17	(Shelton, 1988)
46	Experience in Alliances / Acquisitions	(Haleblian et al., 1999) (Jemison et al., 1986) (Pennings et al., 1994)	17	(Haleblian et al., 1999)
47	Product time to market			
48	Growth	(Feeser et al., 1990) (Walter et al., 1990)	17, 41, 55	(Feeser et al., 1990) (Trautwein, 1990)
49	Market share	(Brush, 1996; Walter et al., 1990) (Mayer et al., 2004)	2	(Brush, 1996)
50	Financial synergies	(Trautwein, 1990) (Chatterjee, 1986) (Hoffman et al., 2001)	2	(Trautwein, 1990)
51	Operational synergies	(Trautwein, 1990) (Chatterjee, 1986; James et al., 1998)	2	(Trautwein, 1990)
52	Managerial synergies	(Trautwein, 1990)	2	(Trautwein, 1990)
53	Net gain	(Trautwein, 1990)	56	(Trautwein, 1990)
54	Increase monopoly	(Trautwein, 1990)	3	(Trautwein, 1990)
55	Empire building	(Trautwein, 1990)	3, 48	(Trautwein, 1990)
56	Efficiency	(Trautwein, 1990) (Walter et al., 1990) (Williamson, 1999)	53	(Trautwein, 1990)
57	CEO's Hubris	(Hayward et al., 1997)		
58	Increase positioning	(Hopkins, 1987) (Walter et al., 1990) (Yip, 1982) (Gulati, 1999)	17, 41, 40, 3	
59	R&D intensity	(Hitt et al., 1991a) (Hitt et al., 1996)	62, 61	(Hitt et al., 1991a)
60	Increase acquisition & development	(Mayer et al., 2004)	17, 61	
61	Rate of internal innovation	(Hitt et al., 1991a) (Hitt et al., 1996) (Hitt et al., 1990)	59, 60, 63, 65	(Hitt et al., 1991a) (Hitt et al., 1996)
62	R&D investment	(Hitt et al., 1991a)	17, 59,	(Hitt et al., 1991a)
63	Acquisition intensity	(Hitt et al., 1996) (Hitt et al., 1990)	64, 65, 61, 13	(Hitt et al., 1991a)
64	Strategic control	(Hitt et al., 1996) (Hitt et al., 1990)	63	(Hitt et al., 1996)
65	Financial control	(Hitt et al., 1996) (Hitt et al., 1990)	63, 61	(Hitt et al., 1996)
66	Transaction cost	(Teece, 1982) (Williamson, 1986) (Williamson, 1975) (Borys et al., 1989) (Eisenhardt, 1989) (Williamson, 1999) (Walker et al., 1984)	17	
67	Risk sharing	(Walter et al., 1990) (Roberts et al., 2001) (Lubatkin, 1983)		
68	Learning by doing	(Hoffman et al., 2001) (Pennings et al., 1994)		
69	Resource endowment	(Hoffman et al., 2001) (Gulati, 1999)		
70	Target firm relative size	(Kusewitt, 1985) (Jemison et al., 1986) (Datta, 1991)	36	
71	Degree of portfolio competitiveness	(Ferrary, 2003)		
72	Risk	(Walter et al., 1990) (Roberts et al., 2001)		
73	Penetrate new markets	(Walter et al., 1990)		
74	Social capital	(Hoffman et al., 2001) (Geletkanycz et al., 1997) (Gulati, 1999)		



strategy, marketing, finance, governance, product development and technology management.

Data Finding and Analysis

Using the software program “Decision Explorer” (Banxia\_Software\_Ltd., 2005) several analyses were conducted mainly the “domain analysis” (table 3), the “centrality analysis” (table 4), the “cluster analysis” (figure 2) and the “loop analysis”.

The “domain analysis” is described in the software manual as follows: “The “domain” command gives an indication of the complexity of linking around concepts. The rationale behind domain analysis is that people tend to talk a lot about what they see as important or key issues, and so certain concepts characterizing these “key issues” will be highly elaborated (a lot of concepts linking into and out of them). Highly elaborated concepts will have a high domain score.”

The “centrality analysis” is described in the software manual as follows: “The “central”

command gives an indication of the influence of a concept in the wider context of the model. This analysis gives an initial indication of the importance of the different concepts in the model. Central analysis is complementary to domain analysis. Central analysis looks beyond the immediate environment (links) around a concept and examines the complexity of links at a number of levels away from the centre. The combined weighting leads to an overall centrality score. The higher the score the more influence the concept has within the model as a whole. A high scoring concept has a complex network of concepts supporting it, and/or a complex network of concepts stemming from it. The topmost central concept may not in itself be top of the domain analysis results, likewise for lower scoring concepts.”

The “cluster analysis” is described in the software manual as follows: “The result of the cluster analysis suggests that, based on the picture of the situation as it stands, an effective solution to

Concepts and their links (positive or negative) to other concepts				
1 > +58 +3	16 > +1	31 > +29	46 > +68 +17	62 > +11 +59
2 > +15 +71 +37 +56 +49 +1	17 > +73 +67 +34 +63 +60 -62 +5 +46 +52 +3 +48 -9 +14 +16 +15 +7 +1 +12	32 > +29	47 > -1	63 > -13 -61 +65 -64
3 > +58 +17	18 > +17	33 > +45	48 > +55 +3	64 > +13
4 > -56	19 > -18	34 > +35	49 > +54 +48	65 > -61 +13
5 > +58	20 > -18	35 > +54 +37	50 > +2	66 > +17
6 > -56 +53	21 > +19 +20	36 > +69 +3	51 > +2	67 > -72
7 > +4	22 > +17	37 > +36	52 > +2	68 > +56
8 > +9 +6	23 > +44	38 > +41	53 > +36 +48	69 > +17
9 > +10	24 > +23	39 > +41	54 > +3	70 > +7 -45
10 > +68 -11	25 > +44	40 > -58 +41	55 > +3	71 > +37 +1
11 > +6	26 > +23 +25	41 > +2 +45	56 > -47 +53	72 > -36
12 > +51 +50 +4 +2	27 > +24 +26	42 > +45	57 > +17	73 > +49
13 > +4 -28	28 > +21 +13 +17	43 > +45	58 > +74	74 > +69
14 > -6	29 > +17	44 > +17	59 > +61	
15 > -6	30 > +27 +11 +29	45 > +17	60 > +61	

TABLE 2. Concepts and their links as drawn in the cognitive mapping

FIGURE 1. CCognitive mapping: Strategy formulation for acquisitions In the information technology industry

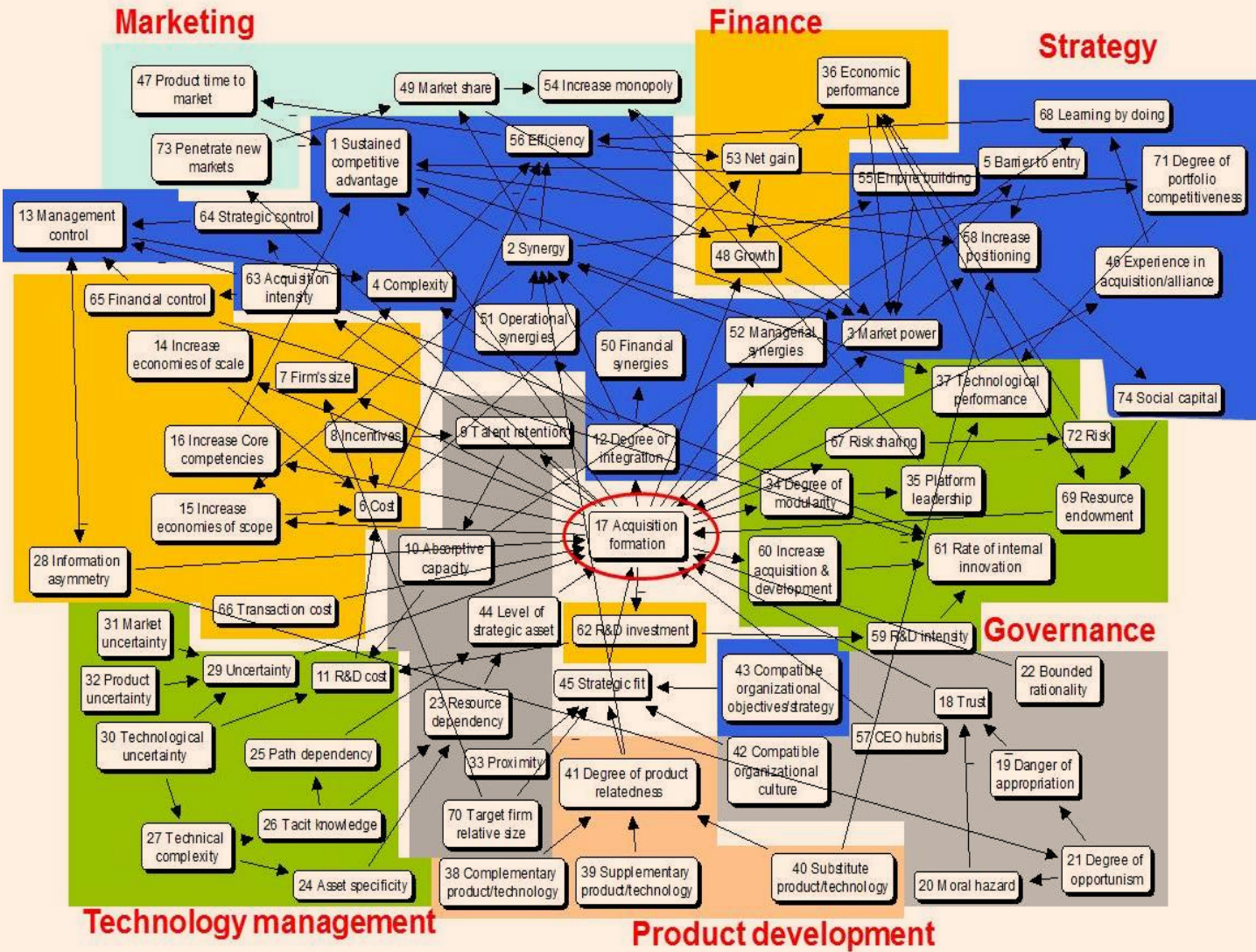
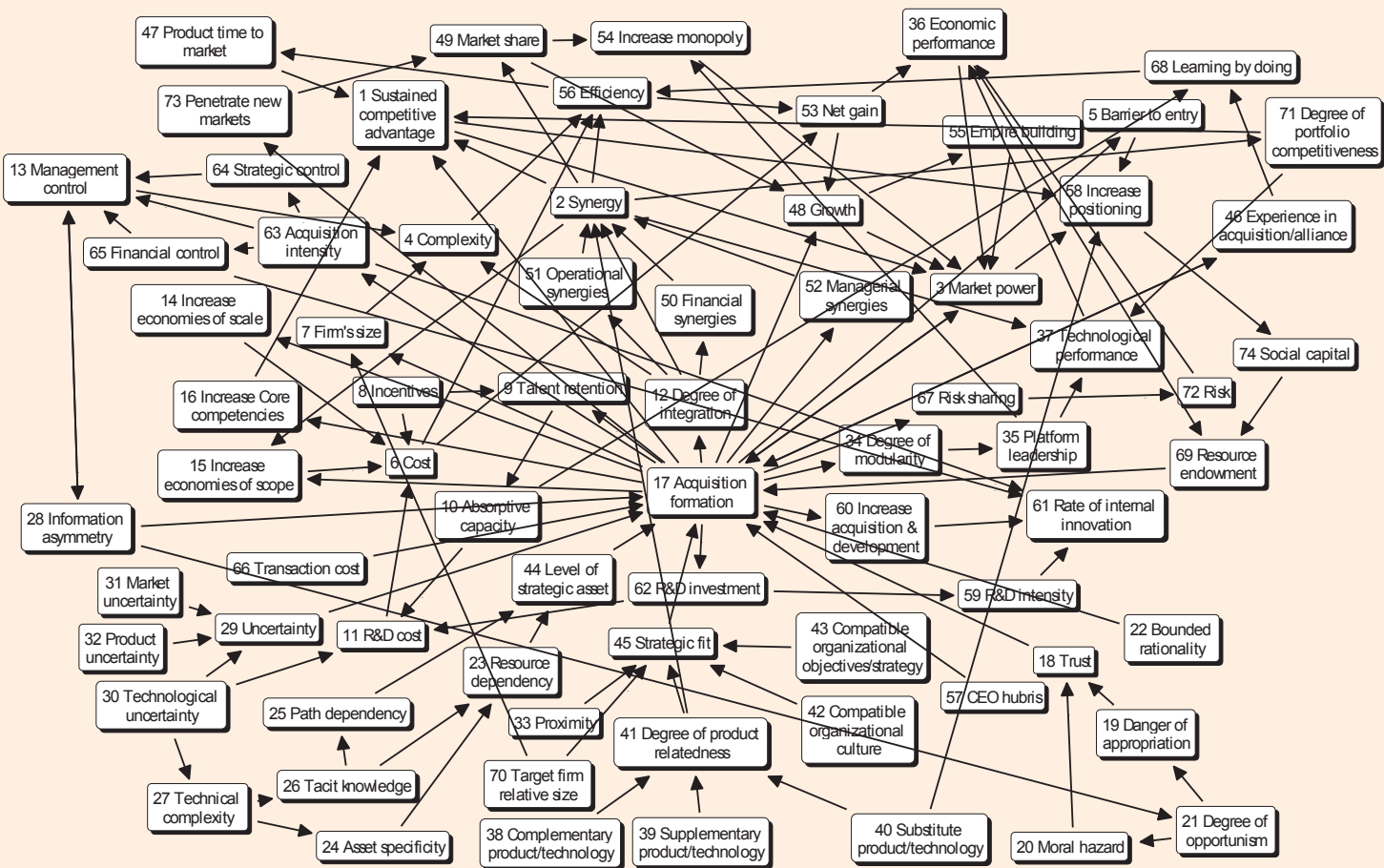


FIGURE 2. Functional cognitive decision groups



the problem would entail addressing all aspects that have been acknowledged in the map, and that there are no areas which can be worked out in isolation. Clustering is very useful because it provides a breakdown of the model and becomes important in helping to manipulate information in large models”. The “loop analysis” is described in the software manual as follows: “Loops are caused when a circle of links is formed, often in a complex chain of argumentation in large models. A Loop is generally a bad thing (*certainly for automated analysis, but it is a matter of debate whether they are generally bad*), as it causes chains of argument to become over-complicated. The LOOP command, in identifying these Loops, allows the user to decide where/whether to break them.”

### 3. Domain analysis

**Table 3** provides a list of the most important consequences of acquisition formation. The concepts listed were selected based on the high number of inputs converging into one concept making it an important consequence. The concept ‘acquisition formation’ is in itself an important consequence resulting from 11 motivations as represented by the 11 inputs converging into it. All those consequences are coherent with the literature on strategic management, and they are a combination of both strategizing and economizing: Market power, cost, and efficiency are for economizing and the rest for strategizing. They are borrowed from the transaction cost economics and the resource based view of the firm. They are in line with legitimate corporate objectives: Increase positioning, sustaining competitive advantage, reduce cost and increase efficiency. Strategic fit is a critical success factor to the formation of acquisition and depends on a series of factors such as proximity of the target firm, its relative size, the degree of product relatedness between the acquirer and the acquired in term of supplementary, complementary or substitute products, the compatibility of both firms’ organizational objectives and cultures. The rate of internal innovation is the product of the R&D intensity, the acquisition intensity, the increase in acquisition and development (*A&D*) and the financial control. The increase in financial control has a negative effect on the rate of innovation as the creative teams feel less autonomous and projects are more controlled. Sustaining competitive advantage is the result of building on and increasing the core competencies of the firm, reducing

the product time to market, produced synergies, and the increased level of the products portfolio competitiveness. Synergy is a result of operational, financial and managerial synergies, the degree of product relatedness between the acquirer and the acquired firm and the degree of integration. The reduction in cost is a product of the decrease in internal R&D cost, the economies of scale and scope and is negatively affected by the increase in incentives given to the management team and skilled human resources of the acquired firm. Market power is the combined product of improving economic performance, growth resulting from an increased market share, sustaining competitive advantage based on the core competencies of the firm, increasing monopoly and empire building. Increasing market power, sustaining competitive advantage and creating barriers to entry for new products, will increase the overall firm position in the market.

**Table 3** also provides a list of the important causes/explanations, which were selected based on the high number of concepts diverging from them, as represented by the number of outputs. Synergy is a consequence and a cause. A consequence from the acquisition formation or at least a desired consequence and a cause or explanation for a diversity of concept affect by it. It’s the engine behind achieving efficiencies, sustaining competitive advantage, increasing economies of scope, and market share, and increasing the degree of portfolio competitiveness. The degree of integration defined by the scope, depth and quality is determinant in producing operational and financial synergies, and reducing the complexity of integrating the two firms. Technological uncertainty adds to the overall uncertainty faced by the firm in this high velocity and turbulent environment, and affects the R&D cost and the degree of technical complexity. Acquisition intensity affects the firm’s strategic, financial and management control, and the internal rate of innovation.

### 4. Centrality analysis

**Table 4** provides a ranking list of the important concepts based on their centrality to the acquisition formation concept. The acquisition formation is clearly the most important concept as it is in the center of the cognitive map with the highest number of inputs and outputs. From the first 10 most important concepts, market power, sustained competitive advantage, strategic fit, degree of integration and acquisition intensity are

Important consequences	Inputs	Outputs	Total
Acquisition formation	11	18	29
Market power	6	2	8
Sustained competitive advantage	5	2	7
Synergy	5	6	11
Cost	4	2	6
Management control	4	2	6
Strategic fit	5	1	6
Efficiency	4	2	6
Increase positioning	4	1	5
Rate of internal innovation	4	0	4

Important causes/explanations	Inputs	Outputs	Total
Acquisition formation	11	18	29
Synergy	5	6	11
Degree of integration	1	4	5
Technological uncertainty	0	3	3
Acquisition intensity	1	4	5

TABLE 3. Domain analysis

present in the centrality analysis list, as they were present in the domain analysis list, which confirm their highly relative importance to the concept of the acquisition formation. Three other concepts present in this list are strongly related to respective concepts present in the domain analysis list: Increasing the economies of scope is related to creating synergy; growth is related to market power; and uncertainty is related to technological uncertainty. The two sets of mirrored concepts reflect the high importance of those concepts to the concept of strategy formation. Finally, the only concept present in this list and not in the domain list is resource endowment, which is necessary to an acquisition formation decision.

### 5. Cluster analysis

The cluster analysis provided two cluster sets as shown in figure 3. In the first cluster set the concept of synergy is in the center with its related direct and indirect links. Important concepts present in this cluster set and in the domain analysis are: cost, efficiency, degree of integration, acquisition intensity, the rate of internal innovation, management control, and sustained competitive advantage. The second cluster set has

in its center the concept of acquisition formation with its direct and indirect links. It represents a smaller version of the original cognitive map with the most affecting links, as in a check list before taking the final decision on the formation of an acquisition.

### 6. Discussion

Acquisition formation is the central concept as it has 11 causal and 18 consequential relationships. Synergy is a balanced concept as it has as many inputs as outputs: 5 causal and 6 consequential relationships. The following concepts are especially important as they have more inputs and few if any outputs: sustained competitive advantage, market power, strategic fit, and rate of internal innovation. From the literature of strategic management, those concepts are key strategic objectives related to the research on acquisitions. Their importance should highlight their critical inputs.

The first ten most central (*important*) concepts are: acquisition formation, market power, sustained competitive advantage, strategic fit, and the degree of integration, increase economies of

Rank	Important concepts	
1	Acquisition formation	48 from 73 concepts.
2	Market power	33 from 68 concepts.
3	Sustained competitive advantage	33 from 70 concepts.
4	Strategic fit	32 from 70 concepts.
5	Degree of integration	32 from 70 concepts.
6	Increase economies of scope	31 from 70 concepts.
7	Acquisition intensity	30 from 66 concepts.
8	Growth	30 from 68 concepts.
9	Uncertainty	30 from 68 concepts.
10	Resource endowment	29 from 68 concepts.
11	R&D investment	29 from 67 concepts.
12	Managerial synergies	29 from 70 concepts.
13	Level of strategic asset	29 from 68 concepts.
14	Synergy	29 from 58 concepts.
15	Penetrate new markets	28 from 67 concepts.
16	Experience in acquisition/alliance	28 from 66 concepts.
17	Degree of modularity	28 from 66 concepts.
18	Information asymmetry	28 from 66 concepts.
19	Increase Core competencies	28 from 68 concepts.
20	Increase economies of scale	28 from 66 concepts.
21	Talent retention	28 from 66 concepts.
22	Firm's size	28 from 66 concepts.
23	Barrier to entry	28 from 66 concepts.
24	Risk sharing	27 from 66 concepts.
25	Increase acquisition & development	27 from 65 concepts.
26	Trust	27 from 65 concepts.
27	Transaction cost	26 from 65 concepts.
28	CEO hubris	26 from 65 concepts.
29	Bounded rationality	26 from 65 concepts.
30	Degree of product relatedness	23 from 52 concepts.
31	Efficiency	22 from 47 concepts.
32	Net gain	22 from 52 concepts.
33	Cost	22 from 50 concepts.
34	Economic performance	21 from 50 concepts.
35	Complexity	21 from 50 concepts.
36	Degree of portfolio competitiveness	20 from 50 concepts.
37	Increase positioning	20 from 47 concepts.

38	Market share	20 from 48 concepts.
39	Product time to market	19 from 50 concepts.
40	Management control	19 from 45 concepts.
41	R&D cost	19 from 46 concepts.
42	Learning by doing	18 from 46 concepts.
43	Increase monopoly	18 from 45 concepts.
44	Operational synergies	18 from 48 concepts.
45	Financial synergies	18 from 48 concepts.
46	Platform leadership	17 from 42 concepts.
47	Technological uncertainty	17 from 43 concepts.
48	Empire building	16 from 43 concepts.
49	Technological performance	16 from 35 concepts.
50	Absorptive capacity	16 from 40 concepts.
51	Social capital	15 from 40 concepts.
52	Risk	15 from 40 concepts.
53	Target firm relative size	15 from 39 concepts.
54	Incentives	15 from 39 concepts.
55	Financial control	14 from 35 concepts.
56	Rate of internal innovation	14 from 34 concepts.
57	Strategic control	13 from 35 concepts.
58	R&D intensity	13 from 36 concepts.
59	Compatible organizational objectives/strategy	13 from 36 concepts.
60	Compatible organizational culture	13 from 36 concepts.
61	Substitute product/technology	13 from 31 concepts.
62	Proximity	13 from 36 concepts.
63	Resource dependency	13 from 33 concepts.
64	Degree of opportunism	13 from 34 concepts.
65	Path dependency	12 from 33 concepts.
66	Product uncertainty	11 from 32 concepts.
67	Market uncertainty	11 from 32 concepts.
68	Moral hazard	11 from 31 concepts.
69	Danger of appropriation	11 from 31 concepts.
70	Supplementary product/technology	8 from 21 concepts.
71	Complementary product/technology	8 from 21 concepts.
72	Technical complexity	7 from 14 concepts.
73	Tacit knowledge	5 from 9 concepts.
74	Asset specificity	4 from 9 concepts.

FIGURE 3. Cluster set 1 and 2

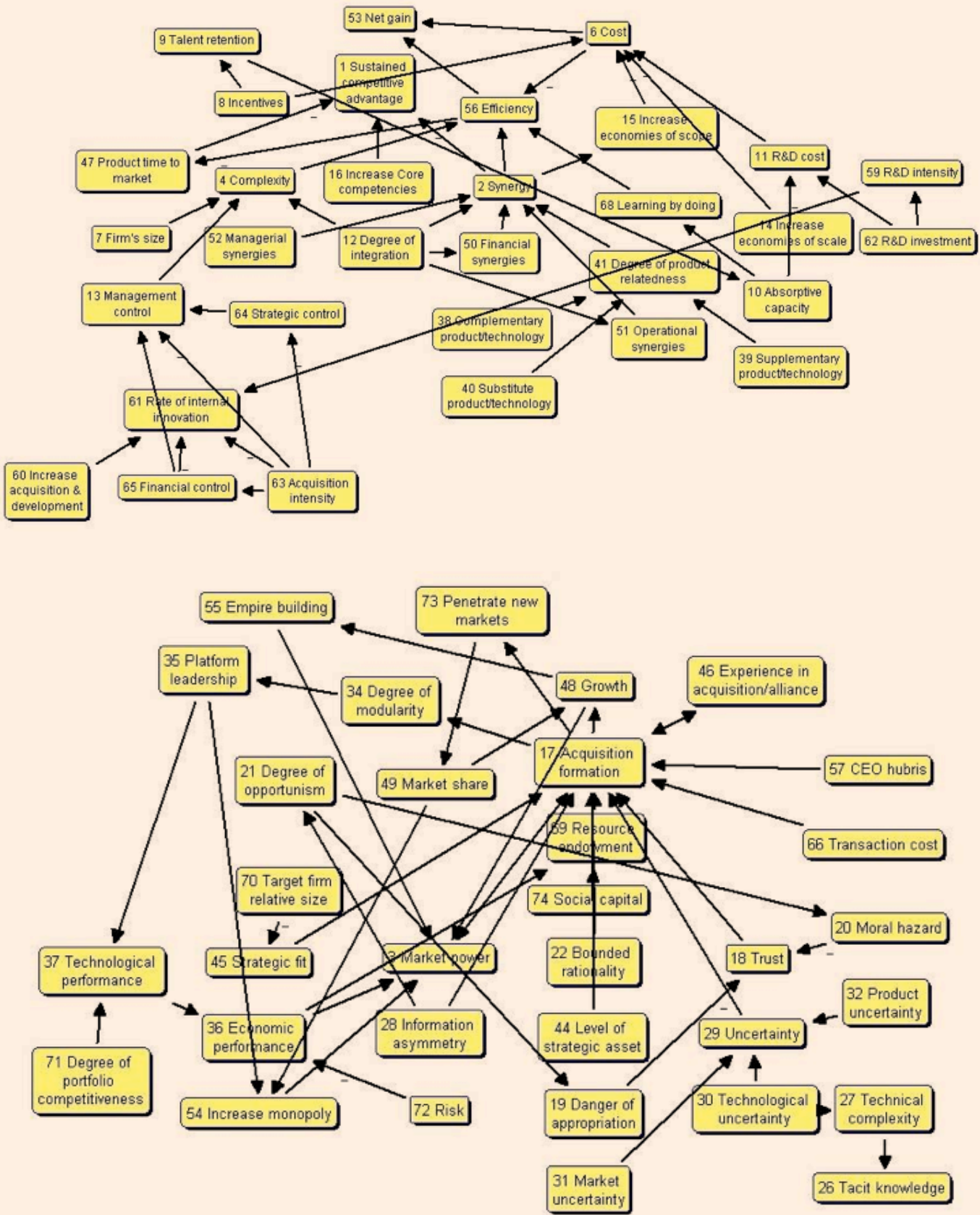


TABLE 4. Centrality analysis



scope, acquisition intensity, growth, uncertainty, and resource endowment.

Loop analysis run for more than two hours and provided more than 3000 loop sets. The analysis was stopped manually. The test was run four times and it gave the same results. Loops are described by the software manual as a bad thing and it is up to the research to revise the links to try to eliminate the loops. However, as the software seems to discover more than 3000 loop set in this cognitive mapping, the question is how would those loops be eliminated? Maybe the large number of loops in the model explains the complexity of the researched subject, as its central concept is related to interrelated links with a large number of feedback loops that either stabilize the model or destabilize it.

The cognitive mapping technique provided the scope to understand a complex and integrated issue, with roots in different disciplines and consequences combining economizing and strategizing. It provided a holistic and integrated approach to the study of a complex research topic such as decision making.

The limitation of this research is in its inability to come up with a theoretical model as different effects vary based on the case studied. The replication of some links and effects on their respective concepts could produce contrasting results based on different case studies. Also the research was based on the context of the information technology industry in North America and it is not clear to what point the results could be generalized on other industries, sectors, or countries.



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