Knowledge Management Technology for Revealing Cognitive Diversity within a Management Team

David P. Tegarden
Department of Accounting and Information Systems
Pamplin College of Business
Virginia Tech
Blacksburg, VA 24061
dtegarde@vt.edu

Linda F. Tegarden
Department of Management
Pamplin College of Business
Virginia Tech
Blacksburg, VA 24061
tegarden@vt.edu,

Steven D. Sheetz
Department of Accounting and Information Systems
Pamplin College of Business
Virginia Tech
Blacksburg, VA 24061
sheetz@vt.edu

Abstract

The cognitive diversity of top management teams has been shown to affect the performance of a firm. However, most approaches to measure cognitive diversity never attempt to open the "black box" to understand what makes up the cognitive diversity of the team. This research reports on an approach that identifies diverse belief structures, i.e., cognitive subgroups, through the use of causal mapping and cluster analysis. The procedures of the approach are automated using group support systems technology resulting a Group Cognitive Mapping System (GCMS). The results from a study of 13 top managers on a strategic planning team for an information services firm show that the use of causal mapping provides an efficient and effective way to identify idiosyncratic and shared knowledge among members of a top management team.

1. Introduction

There continues to be a growing interest in linking cognition to strategic management [36,41]. One aspect especially important to top management team effectiveness is cognitive diversity [24,27]. Cognitive diversity is defined as variation in underlying and invisible cognitive processes such as attitudes, beliefs or values. Multiple beliefs and perspectives are important in order to capture information necessary to interpret complex environments. Kilduff et al [24] found that interpretive ambiguity is positively related to performance during initial decision making stages among simulation teams. An explicit representation of these perspectives could be beneficial to the top management team. On the other hand, cognitive diversity can also be detrimental to top management team effectiveness. Some researchers have hypothesized that the greater the shared understanding, i.e., the lower the cognitive diversity, that exists between individuals that work together, the greater the team's effectiveness [12]. Other researchers have found that the degree of consensus about goals and about the means of achieving them influences the effectiveness of the firm [9,14,15]. One approach to increase the shared understanding between individuals is to make the beliefs and perceptions explicit by modeling different interpretations so as to capture and evaluate both the similarities and differences found in the individuals' cognitions [13,17].

Various approaches have been used to represent individual and shared belief structures. These include team mental models [26], organizational knowledge structure [30], core causal beliefs [33], managerial thought structures [34], and belief structures [40]. Capturing and evaluating both individual and group-level belief structures, via cognitive maps, can make progress towards the goal of understanding the shared and idiosyncratic knowledge contained in individual, group and organizational cognition. Hall [22] has suggested that organizational memory is primarily causal in nature. In the research reported here, our subjects produce causal maps to capture cause and effect relationships that relate the factors that impact firm performance.

The purpose of this research is to describe technology for uncovering cognitive diversity among members of a management team. In the remainder of the paper, we overview the causal mapping-based approach for capturing individual and deriving collective cause maps, give an example of subgroups derived from a study of a strategic planning team through the use of cluster analysis and present evidence of the ability of the approach to reveal cognitive diversity quantitatively and qualitatively.

2. Background

Cognitive mapping is a technique that captures the perceptions of an "individual about a particular issue or problem in a diagrammatic, rather than linear, format"

Proceedings of the 36th Hawaii International Conference on System Sciences (HICSS'03)
0-7695-1874-5/03 $17.00 © 2002 IEEE

[18]. An analysis of various cognitive mapping techniques [3,5,17,23] shows that most of the techniques may be viewed as consisting of three major parts: eliciting concepts, refining concepts, and identifying relationships between concepts. A common characteristic of these approaches is a focus on obtaining the views of people in the problem environment. These views are often obtained using broad questions with the intention that the participants will provide the details they believe are most important. Cognitive mapping techniques have been used to investigate many diverse areas, including beliefs of politicians [3], decision-making aids [6,17,21,23,43], managerial and organizational cognition [20,31] and organizational learning [4,17,25,29].

Cause maps have been used to represent managerial cognition at both the individual and group levels [3,17,23,31]. Even though cause maps have been used to represent group-level cognition, most cognitive mapping approaches only have captured individual cause maps. This has lead to the difficult problem of merging individual maps to create a collective cause map that represents the aggregation of the individual levels. To successfully merge the individual maps, sufficient congregating labels must be identified. This tends to be a very difficult and time-consuming process as researchers must infer the meaning of the beliefs in each individual's idiosyncratic map. When merging these individual maps the research necessarily determines that two individuals have sufficiently similar intent so that a congregating label exists. This introduces the possibility of researcher bias [32]. A congregate map groups individual maps together by merging the maps on the congregating labels.

The use of congregate labels created by the researcher to group similar concepts used across individuals is a common approach of merging individual maps into group maps [6,18,38]. Sheetz et al. [38] define a process that enables the individuals in a decision making team to agree upon the congregate labels so that researcher intervention and bias is minimized.

Sheetz et al. [38] is a modification of the Self-Q Technique [6]. The Self-Q technique is designed to minimize researcher bias by having the participants ask themselves questions and thus determine for themselves what concepts they associate with the domain. However, unlike the Self-Q Technique, their approach eliminates the difficult process of merging individual maps, by having the *group* define the congregating labels before individually identifying the relationships. This group-driven approach is a substantive difference with collective map approaches. In addition, known as the Group Cognitive Mapping System (GCMS) it is implemented in a WWW-based environment using a MS Access database and procedures written Java and SQL.

The GCMS is consistent with the goals of identifying a shared cause map. It couples group support systems technology with cause mapping to provide a mechanism for controlling the potential for researcher bias by having the team identify their congregating labels (categories), rather than the researchers [37]. The group, using the GCMS evaluates the factors to reach a shared understanding and establish sufficient congregating labels (shared knowledge categories). These are used to computationally merge individual cause maps to identify a shared cause map.

3. Methodology and example

In this section we present the methodology used to reveal cognitive diversity along with an example to illustrate the methodology. There were thirteen participants in this study. They were members of a strategic planning team consisting of top management of an IT services firm. The firm's primary source of business was the federal government. The GCMS causal mapping procedures were preliminary steps in a strategic planning process. The GCMS procedures were run in a typical computer lab setting.

The procedures for capturing and evaluating the individual and group cause maps consist of multiple steps. The data captured by the system are useful for understanding the different perspectives that exist among team members, i.e., the cognitive diversity of the management team. The steps are described below.

The causal mapping procedures are implemented by a GCMS session consisting of an agenda of activities. Each data capture activity is supported with a GCMS tool. Throughout the session, a facilitator provides procedural guidance to the group, e.g., administrative activities such as reading instructions and keeping time. To avoid potential researcher bias, at no time does the facilitator provide feedback on group responses.

Individuals first log on to the system to begin the group cognitive mapping session. After successfully logging on, individuals identify concepts, define categories from the meanings of the concepts, determine the relative importance of the categories, and indicate the influence of each category on other categories (See Table 1). Each of the steps and the results obtained in the example study are described below.

3.1. Elicit concepts

The purpose of this step was to allow the participants to identify and exchange their beliefs about the future direction of their firm. A framing statement was presented to the participants to set the context for the brainstorming of concepts. The framing statement consisted of four questions.

1. What do we want to accomplish in the next five years?
2. What is it that we do especially well?
3. What other things should we be doing especially well?
4. What present and future constraints do we face in our operations?

The participants generated 153 concepts or about twelve concepts per participant.

3.2. Identify and define categories

The purpose of this step was to identify and define a set of categories (congregating labels) that group the similar concepts identified in the previous step. Participants looked through the list of concepts to identify those that address a similar issue or idea. The participants then voluntarily proposed a category name and definition to the group. The facilitator recorded the proposed category name on a chalkboard. This continued until the group was satisfied with the group of the proposed categories. Once the categories were created, the facilitator encouraged the group to add, delete, and/or merge categories. This process continued until the group is satisfied with the list of categories and their definitions. Table 2 lists the twelve identified categories and their definitions produced by the participants. This process is intended to allow the group to identify the sufficient congregating labels for identifying the group map.

3.3. Classify concepts

The purpose of this step was to allow the participants to deepen their shared understanding of the categories. In this step, the participants placed each concept into one of the categories defined in the previous step. Concepts that a participant did not feel belonged in one of the categories were placed into an Unknown category. This step was completed when all participants had placed the concepts into categories.

3.4. Rank categories

The purpose of this step is twofold. First, to understand the relative importance of categories to the issue contained in the framing statement. Second, but equally important, this activity is to increase the shared understanding of the meanings of the categories for the participants, i.e., an attempt to ensure that the categories are indeed sufficient congregating labels. In this step, the participants rated the importance of each category to meeting the issues contained in the framing statement. The ratings were converted to rank orders and analyzed. The participants reached a moderate level of agreement on the rank ordering of the importance of each category (Kendall's $W = .514$, $X^2 = 73.572$, $p = .000$).

3.5. Relationship identification

Causal relationships are identified between categories. These relationships provide the final component of creating individual cognitive maps. Relationships are identified without viewing the relationships of other participants. In a cause map, an arrow indicates that a participant perceives that a change in the originating category affects the terminating category. To identify a causal relationship, the participant selects (1) the origin category, (2) the destination category, and (3) the direction (positive or negative) and amount of influence (strong:3, moderate:2, or slight:1) that the origin category has on the destination category. If the participant decides that they should not have included a relationship that is currently in their map, they may remove it. The participant repeats these steps until the participant is comfortable with the displayed map. At which time, the participant saves the map to the system. This activity is completed when all participants have saved their maps.

The process of deriving a collective cause map involves determining the number of participants that identified each possible relationship between the categories. The system derives a series of group causal maps from the individual maps by examining each of the possible relationships among the categories. The number of participants that identified the relationship and the average strength of the relationship are computed. The series of group maps begins with a map containing only the relationships identified by **all** participants (a consensus map) and ends with a map containing relationships identified by any participant (a total map).

3.6. Cognitive subgroup identification

To identify the set of subgroups within the team, we used cluster analysis to group the individual participant maps together. To compute the similarity of one map to another, we computed Jaccard coefficients [10] based on the shared causal relationships among the participants. We can measure similarity in this manner since the nodes in the individual participant maps are identical. In this case, the more shared causal relationships, the greater the similarity is between the maps. The resulting similarity matrix of Jaccard coefficients was used for clustering using Ward's method [1]. Based on the cluster analysis, four subgroups were uncovered.

Table 3 shows the importance ratings for the overall group and the four subgroups. Inspection of the table indicates differences among the subgroups and the subgroups differ from the overall group. The level of

agreement increased among the members of each subgroup in comparison to the level of agreement reached in the overall group. The increased values range from .593 (Cognitive Subgroup 3) to .823 (Cognitive Subgroup 2) compared to .514 for the overall group. This implies that there were different belief systems existing within the overall group.

Table 4 displays the average cognitive centrality of each node (category) in the individual participant maps for the overall group and the cognitive subgroups. Review of the table indicates that the cognitive subgroups differ in terms of which categories have the most influence. The within group agreement is greater for the subgroups than for the overall group. The level of agreement values ranged from .465 (Cognitive Subgroup 4) to .716 (Cognitive Subgroup 3) in comparison to .373 for the overall group.

4. Discussion

The above results demonstrated that there were higher levels of agreement within the cognitive subgroups than within the overall group and that there were differences between the cognitive subgroups. In this section, we describe the agreement reached within each cognitive subgroup and the differences between the cognitive subgroups.

The results reported in Tables 3 and 4 show the level of agreement on both the explicit importance ratings and the cognitive centrality of the categories are greater than what was reached by the overall group. This demonstrates that the members within the cognitive subgroups agreed with one another more than they agreed with members of the other cognitive subgroups. By reexamining the average rating and converted rank order of the importance of each category (see Table 3), we see that there is substantial disagreement between the cognitive subgroups. For example, the Growth category is the most important category for Cognitive Subgroups 3 and 4, while it is only the sixth ranked category for Cognitive Subgroup 2. Furthermore when inspecting Table 4, we see that not only do the rank ordering of the categories by cognitive centrality values differ between the cognitive subgroups, we see that the level of connectivity among the categories are different. For example, the cause maps for Cognitive Subgroup 4 are much more interconnected than the other cognitive subgroups.

Figures 1 through 4 show the consensus causal maps for the cognitive subgroups. The maps are drawn in a left to right order by Givens-Means-Ends. Givens are shown as a lightly shaded box drawn with a solid outline, Means are shown as an unshaded box drawn with a dashed outline, and Ends are shown as a darker shaded box drawn with a dashed outline. Positive causal relationships are shown with a solid arrow, while negative ones are shown with a dashed arrow. The width of the relationship line portrays the strength (1, 2, or 3) of the relationship.

The consensus map for Cognitive Subgroup 1 is shown in Figure 1. This map shows that, from this cognitive subgroup's perspective, Leadership is a very important and causally affects five of the other categories either directly or indirectly. In fact, the only End not affected by Leadership is External Image. Additionally, Growth is a very important End, or goal, for this subgroup. This subgroup also believes that issues related to Organization has a negative, or inverse, causal effect on Personnel Management which has a positive effect on Growth. This subgroup also believes that the Organization category has a negative relationship on Growth of the firm. This belief is counter to the other cognitive subgroups, which believe that Organization has an indirect positive relationship to Growth.

Figure 2 shows the consensus map for Cognitive Subgroup 2. This cognitive subgroup is the only one that included the Competitors category in their consensus map. They believe that Competitor issues will negatively affect the Growth of the firm. They also have an internal and external causal theme that impacts Growth. The internal theme is driven by the Communication category and mediated by the Personnel Management and Organization categories. Based on this theme, it is obvious that this subgroup feels that organizational communication plays an important role in the growth of the firm. The external theme is driven by the External Image and Products categories and is mediated by the Customers and Profitability categories. This theme implies that for the firm to grow, the firm must increase their customers which will only occur if the firm's external image is improved and the firm's products are expanded. This external theme is unique to this subgroup.

The consensus map for Cognitive Subgroup 3 (see Figure 3) is the simplest of the consensus maps. This is the only subgroup whose map does not have any Means. They believe that the Givens (Personnel Management, Communication, Leadership, Organization, and Mkt/Bus Development) directly affect the Growth category. They also do not believe that these categories are interrelated in any manner. As such, it is very difficult to understand how they can use their map to impact the future direction of the firm.

The consensus map for the Cognitive Subgroup 4, is shown in Figure 4. Like Cognitive Subgroup 2, this subgroup too has an internal and external causal themes. The internal theme shows that Communication issues indirectly affect the Growth of the firm via the Leadership and Quality categories. Interestingly, this is the only subgroup that did not see Leadership as a Given. Instead, Leadership only mediates the effect of the Communication and Organization issues have on the Growth of the firm. The external theme is the Products category affects

Growth via the Customers category. This implies for Growth to occur for the firm, the Customer base must be increased which can be done by increasing the Product offerings. However, the two subgroups disagree as to the role that the External Image and Mkt/Bus Development categories play, one believes they are Givens, the other Ends.

5. Summary

Review of the different causal maps of the cognitive subgroups, it is clear, that the different subgroups have different underlying knowledge structures. Furthermore, the identification of the similarities and differences in the knowledge of subgroups is useful for any strategic planning process.

The GCMS provides an efficient and effective way to identify idiosyncratic and shared knowledge among members of a management team. By clustering the individual cause maps, based on their shared causal relationships, we were able to uncover a set of cognitive subgroups within the top management team. The number of cognitive subgroups and their levels of agreement represent measures of cognitive diversity within the team. The similarities and differences in the importance of the categories and the relationships among them qualitatively reveal the nature of differences among team members

The identification of the similarities within each cognitive subgroup and the differences between the cognitive subgroups is useful for a strategic planning facilitator to have as a beginning point for the typical negotiating and bargaining processes that are part of any strategic planning cycle.

The primary limitation for this approach for uncovering cognitive diversity is that the results are illustrative and based on a single management team, and therefore must be considered exploratory. That is, the method and measures of cognitive diversity must be validated by further research. Of course, the perceptions of team members are relevant only to the context of their firm, thus any generalization of the results to other contexts must be done with care.

Further investigation into using causal mapping and cluster analysis to identify cognitive subgroups in top management teams as a way to uncover cognitive diversity is indicated. The approach applied results in both quantitative and qualitative descriptions of differences. Research is needed for tasks other than strategic planning and for teams working in other environments and industries, e.g., government and manufacturing sectors.

6. References

[1] M. Aldenderfer and R. Blashfield, 1984. *Cluster Analysis*, Beverly Hills, CA: Sage, 1984.

[2] W.R. Ashby, *A Design for a Brain*. New York: Wiley, 1952.

[3] R. Axelrod, "The analysis of cognitive maps", In: Axelrod, R. Ed., *Structure of Decision - The Cognitive Maps of Political Elites,* Ch. 3, Princeton, NJ, Princeton University Press, 1976, 55-73.

[4] R.P. Bood, "Charting organizational learning: A comparison of multiple mapping techniques", In: Eden, C. & Spender, J. -C. Eds*., Managerial and Organizational Cognition: Theory, Methods, and Research*, Ch. 12, London, England: Sage Publications, 1998, 210-230.

[5] M.G. Bougon, "Uncovering cognitive maps - The self-q technique", In: Morgan, G. Ed., *Beyond Method: Strategies for Social Research,* Beverly Hills, CA: Sage Publications, 1983, 173-188.

[6] M.G. Bougon, "Congregate cognitive maps: A unified dynamic theory of organization and strategy", *Journal of Management Studies*, 29(3), 1992, 369-389.

[7] M.G. Bougon, N. Baird, J.M. Komocar, and W. Ross, "Identifying strategic loops: the self-q interviews", in A.S. Huff, Ed., *Mapping Strategic Thought*, Ch. 14, Chichester, England: John Wiley and Sons, 1990, 327-354.

[8] M.G. Bougon, K. Weick, and D. Binkhorst, "Cognition in organizations: an analysis of the Utrecht Jazz Orchestra", *Administrative Science Quarterly*, December, 22, 1977 606-639.

[9] L.J. Bourgeois III, "Performance and consensus", *Strategic Management Journal,* 1, 1980, 227-248.

[10] B.R. Boyce, C.T. Meadow, and D.H. Kraft, *Measurement in Information Science*, San Diego, CA: Academic Press, 1994.

[11] R. Calori, G. Johnson, and P. Sarnin, "CEOs' cognitive maps and the scope of the organization", *Strategic Management Journal*, 15, 1994, 437-457.

[12] J.A. Cannon-Bowers, E. Salas, and S.A. Converse, "Cognitive psychology and team training: Shared mental models in complex systems", *Human Factors Bulletin*, 33, 1990, 1-4.

[13] R.L. Daft, and K. Weick, "Toward a model of organizations as interpretation systems", *Academy of Management Review*, 9, 1984, 284-295.

[14] G.G. Dess, "Consensus on strategy formulation and organization performance: Competitors in a fragmented industry", *Strategic Management Journal*, 8, 1987, 259-277.

[15] G.G. Dess, and N.K. Origer, "Environment, structure and consensus in strategy formulation: A conceptual integration", *Academy of Management Review*, 12, 1987, 313-330.

[16] C. Eden, "On the nature of cognitive maps", *Journal of Management Studies*, May, 29(3), 1992, 261-265.

[17] C. Eden and F. Ackermann, *Making Strategy: The Journey of Strategic Management*, London, England: Sage Publications, 1998a.

[18] C. Eden and F. Ackermann, "Analyzing and comparing idiographic causal maps", In: Eden, C. & Spender, J. -C. (Eds.), *Managerial and Organizational Cognition: Theory, Methods, and Research*, Ch. 11 London, England: Sage Publications, 1998b, 192-209.

[19] C. Eden, F. Ackermann and S. Cropper, "The analysis of cause maps", *Journal of Management Studies*, May, 29(3), 1992, 309-324.

[20] C. Eden and J.C. Spender, *Managerial and Organizational Cognition: Theory, Methods, and Research*, London, England: Sage Publications, 1998.

[21] M. Fiol and A.S. Huff, "Maps for managers: Where are we? where do we go from here?", *Journal of Management Studies*, May, 29(3), 1992, 267-285.
[22] R. Hall "The natural logic of management policy making: Its implications for the survival of an organization", *Management Science*, 30, 1984, 905-927.
[23] A.S. Huff, .*Mapping Strategic Thought*, Chichester, England: John Wiley and Sons, Ltd., 1990.
[24] M. Kilduff, R. Angelmar, and A. Mehra, "Top management-team diversity and firm performance: Examining the role of cognitions", *Organization Science*, 11, 2000, 21-34.
[25] R. Klimecki and H. Lassleben, "Modes of Organizational Learning: Indications From an Empirical Study", *Management Learning*, 29(4), 1998, 405-430.
[26] R. Klimoski and S. Mohammed, "Team mental model: Construct or metaphor?", *Journal of Management*, 20, 1994, 403-437.
[27] D. Knight, C.L. Pearce, K.G. Smith, J.D. Olian, H.P. Sims, K.A. Smith, P. Flood, "Top management team diversity, group process, and strategic consensus", *Strategic Management Journal*, 20, 1999, 445-465.
[28] K. Langfield-Smith, "Exploring the need for a shared cognitive map", *Journal of Management Studies*, May, 29(3), 1992, 349-368.
[29] S. Lee, J.F. Courtney, and R.M. O'Keefe, "A system for organizational learning using cognitive maps," *Omega*, 20(1), 1992, 22-36.
[30] M.A. Lyles and C.R. Schwenk, "Top management, strategy and organizational knowledge structures", *Journal of Management Studies*, 29, 1992, 155-174.
[31] J.R., Meindl, C. Stubbart, and J.F. Porac, Eds., *Cognition Within and Between Organizations*. Thousand Oaks, CA: Sage Publications, 1996.
[32] D. Nicolini, "Comparing methods for mapping organizational cognition," *Organization Studies*, 20(5), 1999, 833-860.
[33] J.F. Porac, H. Thomas, and C. Baden-Fuller, "Competitive groups as cognitive communities: The case of Scottish knitwear manufacturers," *Journal of Management Studies*, 26, 1989, 397-416.
[34] R.K. Reger, "Managerial thought structures and competitive positioning", In Huff, A.S. (Ed.), *Mapping Strategic Thought*, Chichester, England: John Wiley & Sons, 1990, 71-88.
[35] R.K. Reger and A.S. Huff, "Strategic groups: A cognitive perspective", *Strategic Management Journal*, 14, 1993, 103-124.
[36] C.R. Schwenk, 1995. Strategic decision making. *Journal of Management*, 21, 1995, 471-493.
[37] S.D. Sheetz, D.P. Tegarden, K.A. Kozar, and I. Zigurs, "A group support systems approach to cognitive mapping", *Journal of Management Information Systems*, 11(1), 1994, 31-57.
[38] S.D. Sheetz, G. Irwin, D.P. Tegarden, H.J. Nelson, and D.E. Monarchi, "Exploring the Difficulties of Learning Object-Oriented Techniques", *Journal of Management Information Systems*, 14(2), 1997, 103-132.
[39] E.C. Tolman, "Cognitive maps in rats and men", *Psychological Review*, July 1948; 55, 189-208.
[40] J.P.Walsh, "Selectivity and selective perception: An investigation of managers' belief structures and information processing", *Academy of Management Journal*, 31, 1988, 873-896.
[41] J.P. Walsh, "Managerial and organizational cognition: Notes from a trop down memory lane", *Organization Science*, 6, 1995, 280-321.
[42] K.L. Weick, *The Social Psychology of Organizing,* 2nd Edition, Reading, MA: Addison-Wesley, 1979.
[43] K.L. Weick and M.G. Bougon, "Organizations as cognitive maps: Charting ways to success and failure," In: Sims H. and Gioia, D. Eds., *The Thinking Organization: Dynamics of Organizational Cognition*, San Francisco, CA: Jossey-Bass, 1986, 102-135.

Table 1: Causal mapping procedures.

Activity	Description
1. Elicit Concepts Introduction	Log in screen and presentation of the framing statement and stall diagram.
Concept Identification	Elicit characteristics, concepts, and/or issues that contribute to strategic situation of the firm in the case. Comments are shared among all participants as they are entered.
2. Identify Categories Category Identification	Elicit categories that group concepts by similarity; agree on category definitions and names. Each participant verbally suggests a category name and definition. Other participants comment on the name and definition. The facilitator lists the names and records the definition using the system.
3. Classify Concepts Concept Categorizations	Each participant classifies the concepts into categories.
4. Rank Categories Category Rating Step	Each participant rates each category on a 9-point scale, from important to extremely important without knowing the responses of other group members..
5. Define Relationships Identify Relationships	Each individual selects from list uses the system to identify causally related categories. Each causal relationship is assigned a direction (positive + or inverse -) and a strength from 1 to 3 for a scale of -3 to +3, from strong negative influence to strong positive influence of one category on another category.

Table 2: Participant Identified Categories and Definitions

Category Name	Definition
Growth	Of the company, customer base, revenues.
Profitability	ROI, stock value, fee, expectations.
Communication	Internal vertically and horizontally.
Personnel Mgmt.	Compensation, recruiting, HR, training, retention.
Organization	Getting better organized, corporate structure, organized to meet goals.
External Image	New logo, too stakeholders, reputation, public image, name recognition.
Products	Information technology, services, solutions, expansion.
Customers	Anyone paying us money, internal functions.
Marketing/BusDev	Business development, strategic posturing, how to get customers.
Leadership	Accountability, ethics/corporate values, developing vision.
Quality	How you do the job, meet customer expectations, internal/external, compliance.
Competitors	Anyone who could take our work, internal component, anyone with work we want.

Table 3: Average Category Importance Rating (and Converted Rank) by Group

Category	Overall Group	Cognitive Subgroups			
		1	2	3	4
Growth	8.31 (1)	8.00 (3)	6.50 (6)	8.67 (1)	8.83 (1)
Leadership	7.69 (2)	7.50 (4)	7.50 (2)	7.00 (4)	8.17 (2)
Personnel Management	7.69 (2)	8.50 (1)	7.00 (4)	7.00 (4)	8.00 (4)
Mkt/Bus Development	7.31 (4)	8.50 (1)	7.50 (3)	6.67 (6)	7.17 (5)
Communication	7.15 (5)	7.00 (5)	8.50 (1)	8.00 (2)	6.33 (7)
Customers	6.54 (6)	5.50 (9)	7.00 (4)	6.33 (7)	6.83 (6)
Quality	6.54 (6)	7.00 (5)	2.00 (10)	6.00 (8)	8.17 (2)
Organization	6.15 (8)	6.00 (8)	5.00 (7)	8.00 (2)	5.67 (9)
Profitability	5.69 (9)	7.00 (5)	5.00 (7)	4.67 (9)	6.00 (8)
Products	4.31 (10)	5.00 (10)	0.50 (11)	4.00 (11)	5.50 (10)
External Image	3.77 (11)	3.00 (11)	4.50 (9)	4.33 (10)	3.50 (11)
Competitors	2.00 (12)	1.00 (12)	0.50 (11)	1.00 (12)	3.33 (12)
Rank Order Agreement					
Kendall's W	.514	.718	.823	.593	.620
X^2	73.572	15.785	18.099	19.556	40.937
p	.000	.149	.079	.052	.000

Table 4: Average Cognitive Centrality (and Converted Rank) by Group

Category	Overall Group	Cognitive Subgroups			
		1	2	3	4
Growth	12.31 (1)	8.50 (1)	10.00 (1)	5.67 (3)	16.00 (1)
Personnel Management	7.46 (2)	7.50 (2)	4.00 (5)	6.67 (1)	9.00 (7)
Quality	7.31 (3)	5.50 (5)	3.00 (10)	3.33 (6)	11.33 (2)
Leadership	7.08 (4)	6.00 (3)	3.50 (9)	4.00 (4)	10.17 (5)
Mkt/Bus Development	6.92 (5)	6.00 (3)	4.00 (5)	2.67 (7)	10.33 (4)
Profitability	6.92 (5)	5.00 (6)	5.00 (3)	2.33 (8)	10.50 (3)
Communication	6.77 (7)	5.00 (6)	4.00 (5)	4.00 (4)	9.67 (6)
Customers	6.15 (8)	4.00 (8)	6.50 (2)	1.67 (10)	9.00 (7)
Organization	5.77 (9)	4.00 (8)	4.50 (4)	6.00 (2)	6.67 (11)
External Image	5.62 (10)	4.00 (8)	4.00 (5)	2.00 (9)	8.50 (10)
Products	5.23 (11)	2.00 11)	2.50 (11)	1.67 (10)	9.00 (7)
Competitors	3.08 (12)	1.50 (12)	2.00 (12)	0.67 12)	5.17 (12)
Rank Order Agreement					
Kendall's W	.373	.536	.660	.716	.465
X^2	53.406	1.800	14.513	23.627	30.711
P	.000	.379	.206	.014	.001

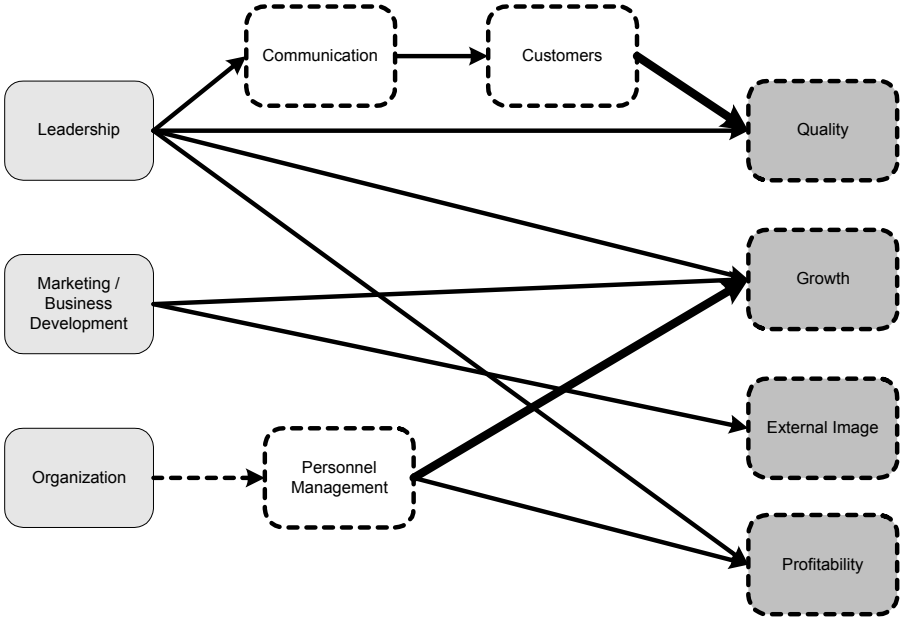

Figure 1: Cognitive Subgroup 1 Consensus Map

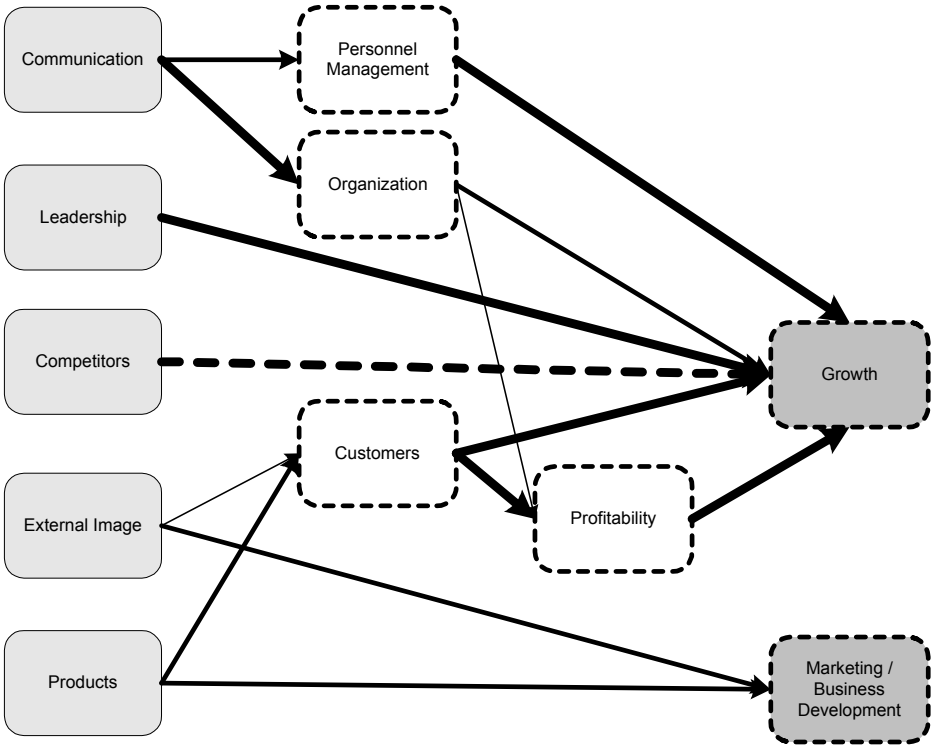

Figure 2: Cognitive Subgroup 2 Consensus Map

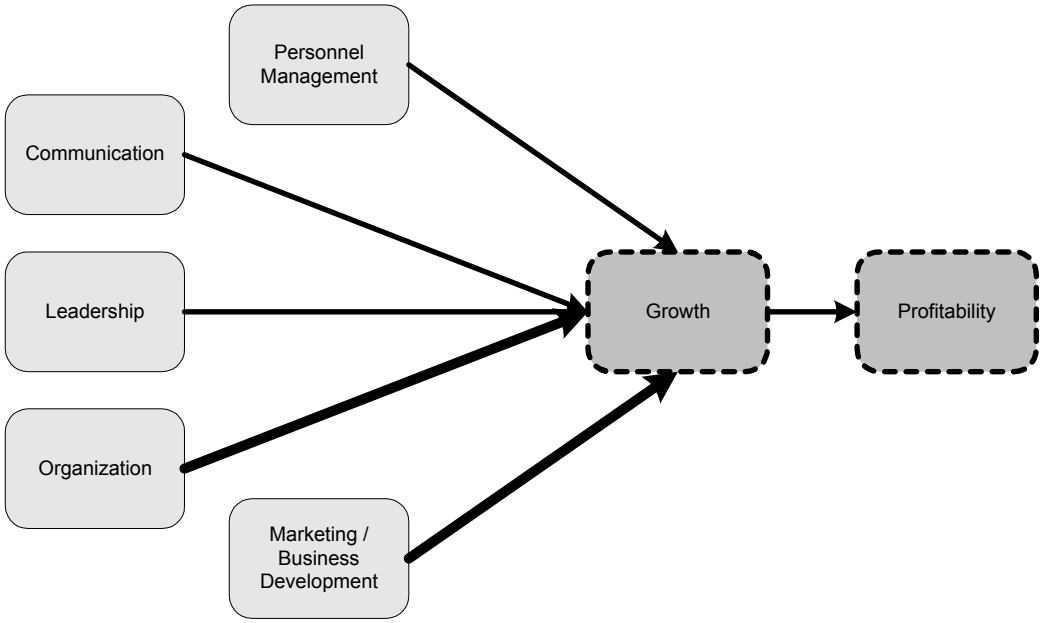

Figure 3: Cognitive Subgroup 3 Consensus Map

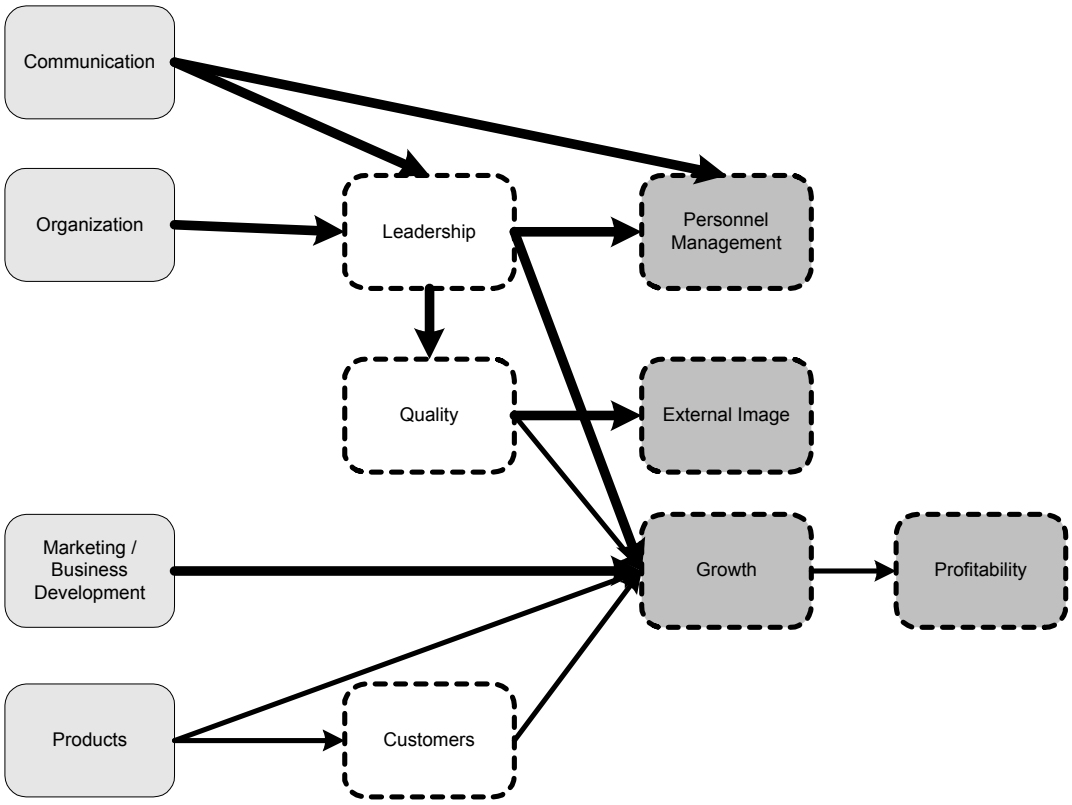

Figure 4: Cognitive Subgroup 4 Consensus Map