

PRELIMINARY FINDINGS: INFORMATION TECHNOLOGY
IN A LEARNING ORGANIZATION - Case Study and Causal Diagramming

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1. Introduction

This study addresses the role information technology plays in a learning organization. In general, a learning organization takes advantage of current and past knowledge to further the goals of the business. Information technology permeates business organizations today as the trend to automate continues to accelerate daily. In many instances, information technology helps businesses do things quicker, better and cheaper; in most cases this results in better profitability.

Case study represents a vast source of past business knowledge available to learn from to influence future decisions. Causal diagrams will help the business analyst identify the major influencing factors of the case and the feedback mechanism that impacts the case results. This study presents the hypothesis that the collaborative effect of case study and information technology using causal diagramming in a learning organization will improve the potential of businesses to adapt to new competitive situations.

2. Review of Literature

This study surveys the current literature regarding learning organizations and information technology's role with a particular emphasis on case study and causal diagrams defined as System Dynamics information technology.

2.1 LEARNING ORGANIZATIONS

According to Dixon (1993) the reason that most organizations are inefficient learners is their lack of systematic processes to facilitate learning. The literature review that follows is organized around the derived distinguishing characteristics based on the following clustered attributes of learning organizations:

- 1.0 "Total Systems Perspective"
 - 1.1 Inquire into systemic consequences (Koffman & Senge, 1995)
 - 1.2 Acknowledge primacy of whole v. pieces (Koffman & Senge, 1995)
 - 1.3 Facilitate systems perspective (systemic relationships) (Nevis, et al., 1995)
 - 1.4 Systems thinking (exam whole vs. parts) (Senge, 1990)
 - 1.5 Facilitate-scanning imperative (aware of environment) (Nevis, et al., 1995)
 - 1.6 Use nonlinear thinking (Koffman & Senge, 1995)
- 2.0 "Performance and Practice"
 - 2.1 Detect and correct errors (Argiris & Schön, 1978)
 - 2.2 Arise through performance and practice (Koffman & Senge, 1995)
 - 2.3 Facilitate performance-gap (actual v. desired state) (Nevis, et al., 1995)
 - 2.4 Act on knowledge and understanding (Fiol & Lyles, 1985)
- 3.0 "Servant Leaders"
 - 3.1 Build community of servant leaders (Koffman & Senge, 1995)
 - 3.2 Facilitate-multiple advocates (no one champion) (Nevis, et al., 1995)
 - 3.3 Construct structures and strategies (organization & workforce skills) (Dodgson, 1993)
 - 3.4 Facilitate-involved leaders (engage in vision actions) (Nevis, et al., 1995)
- 4.0 "Experimental Mindset"
 - 4.1 Use "managerial practice fields" (Koffman & Senge, 1995)
 - 4.2 Facilitate-measurement (strive to quantify) (Nevis, et al., 1995)
 - 4.3 Facilitate-experimental mindset (act like a researcher) (Nevis, et al., 1995)
- 5.0 "Shared Problem Solving"
 - 5.1 Facilitate-open climate (share problem/error/lesson) (Nevis, et al., 1995)
 - 5.2 Facilitate-education (sense that learning is never over) (Nevis, et al., 1995)
 - 5.3 Team learning (suspend assumptions & think freely) (Senge, 1990)
 - 5.4 Personal Mastery (to be the best possible) (Senge, 1990)
- 6.0 "Shared Vision"
 - 6.1 Facilitate-operational variety (diversity v. singularity) (Nevis, et al., 1995)
 - 6.2 Build Shared Vision (truly shared picture of the future) (Senge, 1990)
 - 6.3 Mental Models (separate the map from the territory) (Senge, 1990)

2.2 CASE STUDY

The case method was used as far back as the 5th century BC, when Socrates taught his students to reason on their own by asking them questions instead of lecturing them. The principle underlying the case method is that it takes more than a simple recitation of facts for students to learn. The concept is that true learning takes place through experience and discovery. New ideas need to be tested, combined with current knowledge and repeatedly applied to realistic problem situations in order to be thoroughly internalized by the student (Huff, Tawfik, Cash, & Pifko, 1996, p. 2).

According to Hahn (1996) a well constructed written case report will contain the following elements:

1. Executive Summary. This is a concisely written statement, usually found at the front of the report, that briefly summarizes the major points of the case and its solution. It should include a specific statement of the central problem, the proposed solution, and a short explanation of the logic supporting the proposed solution.
2. Problem Statement. The central issue(s) or major problem(s) in the case is presented here. It does not reproduce the case, but assumes that anyone reading the report has already read the case.
3. Alternatives. All the relevant alternatives are concisely discussed. The major facts and assumptions both for and against each alternative are briefly presented.
4. Conclusion. A condensed presentation of the analysis leading to the selection of a particular solution is given. The discussion includes the reasons for rejecting the other alternatives.
5. Implementation. A program that will lead to the quick and effective implementation of the decision is explained so the reader of the report can see how the decision may be converted into reality.

2.3 INFORMATION TECHNOLOGY AND ORGANIZATION LEARNING

Sprague and McNurlin (1993) point out that top management look on information technology as necessary for company operations but as having little effect on the heart of the business, e.g., earnings, market share, and developing new ventures (p. 68). The authors point out that this view is changing and information technology does influence competitive measures. Systems are competitive tools in their view.

Huber (1991) describes the following information technology processes, or constructs, that contribute to organizational learning: knowledge acquisition, information distribution, and information interpretation. Learning occurs when an organization acquires knowledge. Acquisition of declarative knowledge or facts and information is achieved by using information technology to store, manage, and retrieve information, carrying out research and development, carrying out education and training, patent watching, and bibliometrics (Dodgson, 1993). Learning occurs not only due to knowledge acquisition from outside the organization but also due to the rearrangement of existing knowledge, the revision of previous knowledge structures, and the building and revision of theories.

2.4 SYSTEMS DYNAMICS AND ORGANIZATIONAL PROBLEM-SOLVING

System Dynamics helps to establish the behavior of systems over time and to investigate ways of understanding, improving or controlling system performance. According to Wolstenholme (1990), System Dynamics is a rigorous method for qualitative description, exploration and analysis of complex systems in terms of their processes, information, organizational boundaries and strategies, which facilitates quantitative simulation modeling and analysis for the design of the system structure and control.

According to Forrester (1991) the System Dynamics process starts from a problem to be solved, a situation that needs to be better understood, or an undesirable behavior that is to be corrected or avoided. The first step is to tap the wealth of information that people possess in their heads. He believes that the mental data base is a rich source of information about the parts of a system, about the information available at different points in a system, and about the policies being followed in decision making. System Dynamics and learner-centered learning (Forrester, 1992, p.7) are two mutually reinforcing developments that now promise a learning process that can enhance breadth, depth, and insight in business.

3. Methodology

A qualitative comparison of case studies and causal diagrams was performed to illustrate the collaborative role of information technology in a learning organization. The qualitative comparison shows how case study and causal diagrams will affect the opportunity for learning.

Given a set of Learning Organization attributes, the next step toward testing the study hypothesis was an assessment of the ones satisfied by case study as opposed to causal diagrams to indicate whether any overlap or uniqueness between them exists. Once the case material was analyzed using both the Case Study and Causal Diagram approach, the results were compared to determine whether there was a collaborative benefit. The comparison identified the similarities and difference between the two approaches.

4. The Data Analysis Section

The Xerox case study (Cash, McFarlan, McKenney and Applegate, 1992) was evaluated by independent reviewers using a set of questions and a range of agreement ratings from 1 to 5 with 5 representing the highest level of agreement and 1 the least agreement. For graphic illustrations, the scores were converted as follows: 1 to -2; 3 to 0; 4 to 1; and 5 to 2.

The cases were briefed so that each reviewer had a consistent set of information to use to compare to the, likewise provided, causal diagram and the derived learning organization attributes. For each case the same set of instructions were provided for the reviewers as illustrated below.

Case Brief	Criteria	Disagree to Agree <12345> Enter One
1	The case brief represents the case.	
2	The essential facts are identified.	
3	The case issue is identified.	
4	The case decision is presented.	
5	The case reasoning is given.	
6	The case brief corroborates the causal diagram.	
7	The case brief presents unique information as compared to the causal diagram.	
8	The case brief supports the learning organization attributes.	
9	The case brief supports the learning organization attributes that are unsupported by the causal diagram.	
10	The case brief sets the stage for further analysis to gain insight to the case.	

The causal diagrams were derived from the same source case studies as the case briefs. The case studies were analyzed to identify causal relationships and major feedback loops. The case issue is "bolded" in the causal diagram and corresponds to the case brief issue. The causal diagram reviewers were provided instructions and the set of questions that follow:

Causal Diagram	Criteria	Disagree to Agree <12345> Enter One
1	The causal diagram represents a mental model of the case.	
2	The feedback loops agree with the case facts.	
3	The case issue corresponds to a feedback loop.	
4	There is an amplification factor involved in the causal diagram.	
5	There is a delay factor involved in the causal diagram.	
6	The causal diagram corroborates the case brief.	
7	The causal diagram highlights unique influencing factors as compared to the case brief.	
8	The causal diagram of the case supports the learning organization attributes.	
9	The causal diagram supports learning organization attributes that are unsupported by the case brief.	
10	The causal diagram sets the stage for simulating the case for further insight.	

The learning organization attributes were derived from the research literature and aggregated into categories. The learning organization categories (1-6), as presented earlier in this text, are presented below. Reviewers were asked to please read the category title and review its attributes. The numbers associated with the learning organization categories and attributes refer to references in this dissertation, Section 2.1.

The reviewers were asked to please complete the following form by entering “Yes”, “No”, or “Not Applicable” to signify their opinion whether the subject case study or causal diagram supported the six clustered learning organization attributes. The entries below are illustrative only.

Clustered Learning Attribute	Case Study	Causal Diagram
Total System Perspective	No	Yes
Performance and Practice	No	Yes
Servant Leaders	Not Applicable	Not Applicable
Experimental Mindset	No	Yes
Shared Problem Solving	Yes	Yes
Shared Vision	Yes	Yes

4.1 DATA ANALYSIS - XEROX CASE STUDY

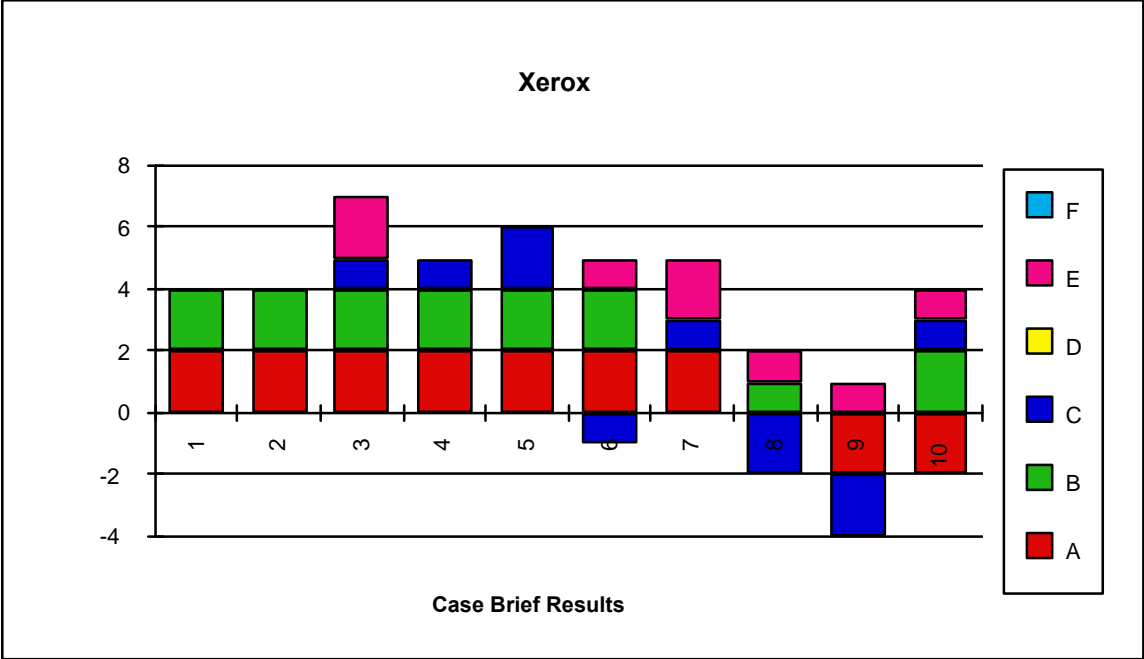
The Xerox case study represents the challenge of leadership in an information technology driven company. Xerox is a multinational company competing in the copier business products and systems, and financial services markets. Xerox’s business goals were customer satisfaction, improved return on assets and increased market share. Xerox had a high commitment to “quality”. The mission at the time of the case study was to develop the information technology strategy for Xerox and ensure that the strategy was implemented in all of the business units.

Xerox Case Brief - The Xerox case brief below provides information for review and analysis. The reviewer was requested to please read the brief and complete the evaluation form ratings from 1-5. The Xerox case brief is presented below:

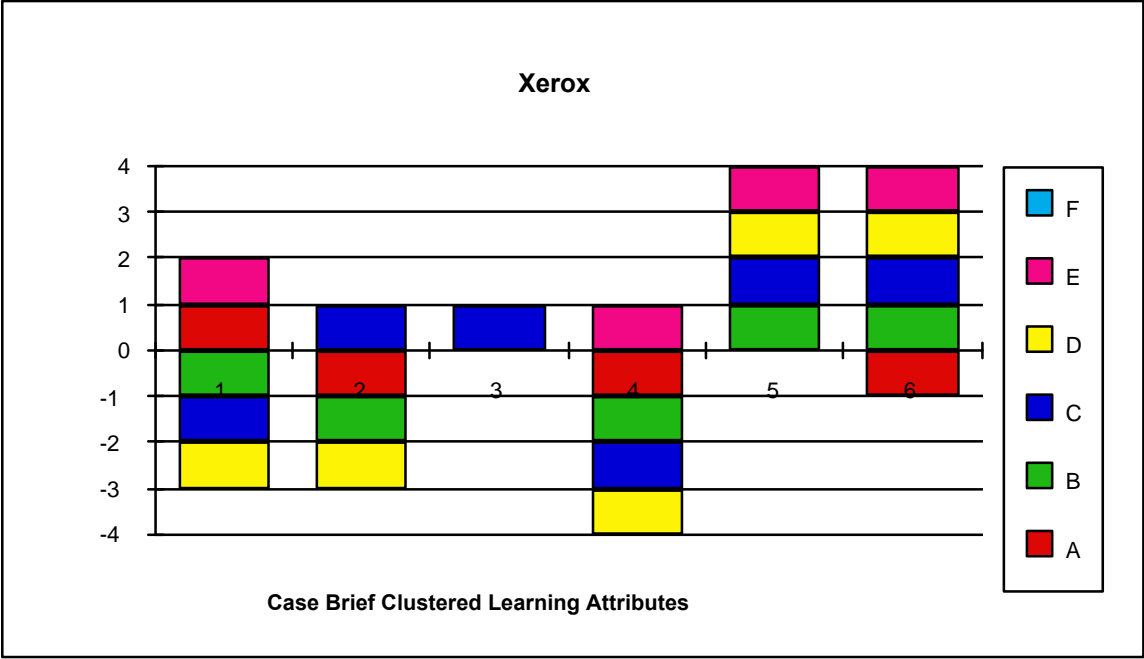
Facts:

1. Barron became Director of the Corporate Information Management (CIM) staff organization in ‘87.
2. CIM mission was to develop Information Technology (IT) strategy to ensure implementation by all business units.
3. The Information System (IS) budget was \$500M with a growth rate of 20% per year.
4. Barron created a new CIM mission statement in ‘88 to emphasize “people development”.
5. The Business Products and Systems (BPS) segment developed, manufactured, marketed and serviced a complete range of document-processing products.
6. The Financial Services (FS) division provided financial products and services.
7. In ‘70 key patents expired and Xerox faced increased competition.
8. In ‘80s Japan sold copiers for what it cost Xerox to make them.
9. In ‘86 BPS accounted for \$9.4B in revenue (72% of the total revenue).
10. In ‘86 FS accounted for 28% of total revenue.
11. In ‘86 FS’s profit of \$278M exceeded for the first time BPS’s profit contribution.
12. CIM had two sets of customers: Corporate Management and BPS.
13. CIM provided consulting services only to FS.
14. Corporate Management expected CIM to ensure that the \$500M IT budget was well spent.
15. BPS managers resented CIM “auditing” how IT \$s were spent.
16. CIM managers felt they should be advocates for how IT \$ were spent, e.g., support and visibility to Corporate Management as opposed to adversaries.
17. There were no clear definitions of the responsibilities of the centralized CIM group and decentralized business units, i.e. BPS.

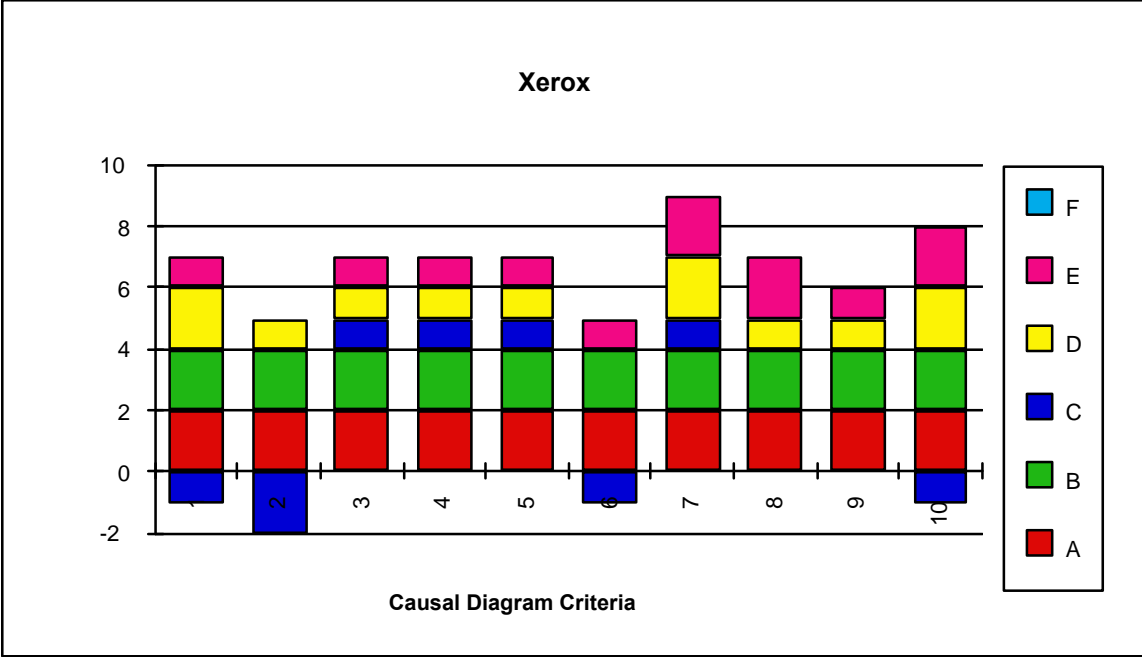
Issue: Will the new mission statement direction for CIM provide the information technology leadership the corporation needed?



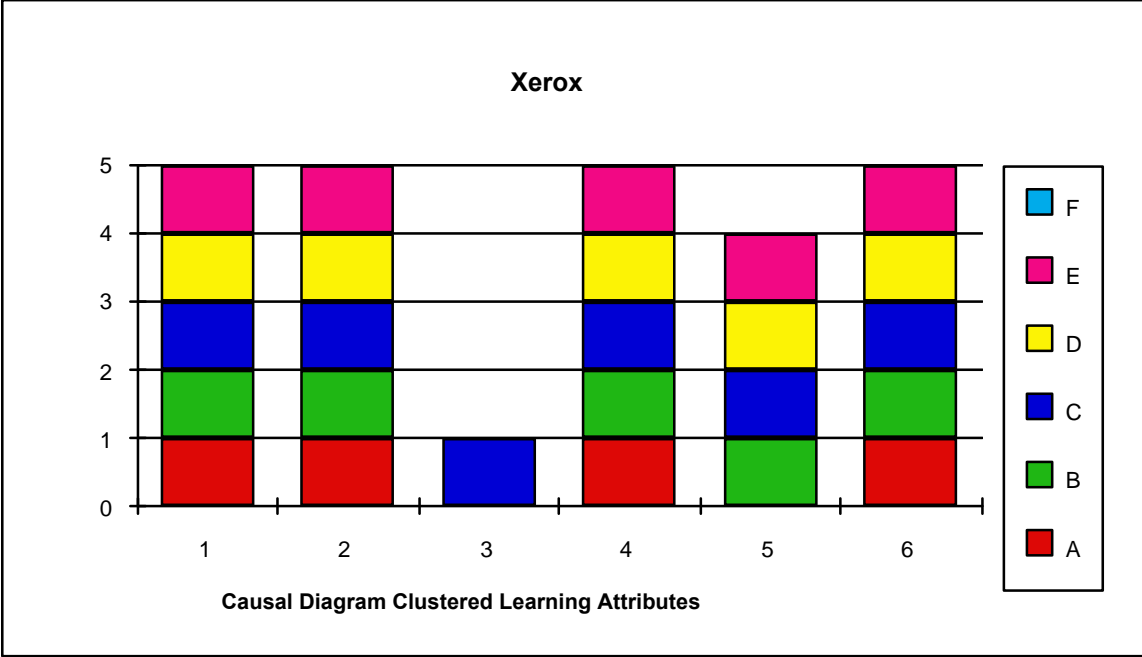
The case brief results compare the reviewer scores to the ten (1-10) case brief criteria.



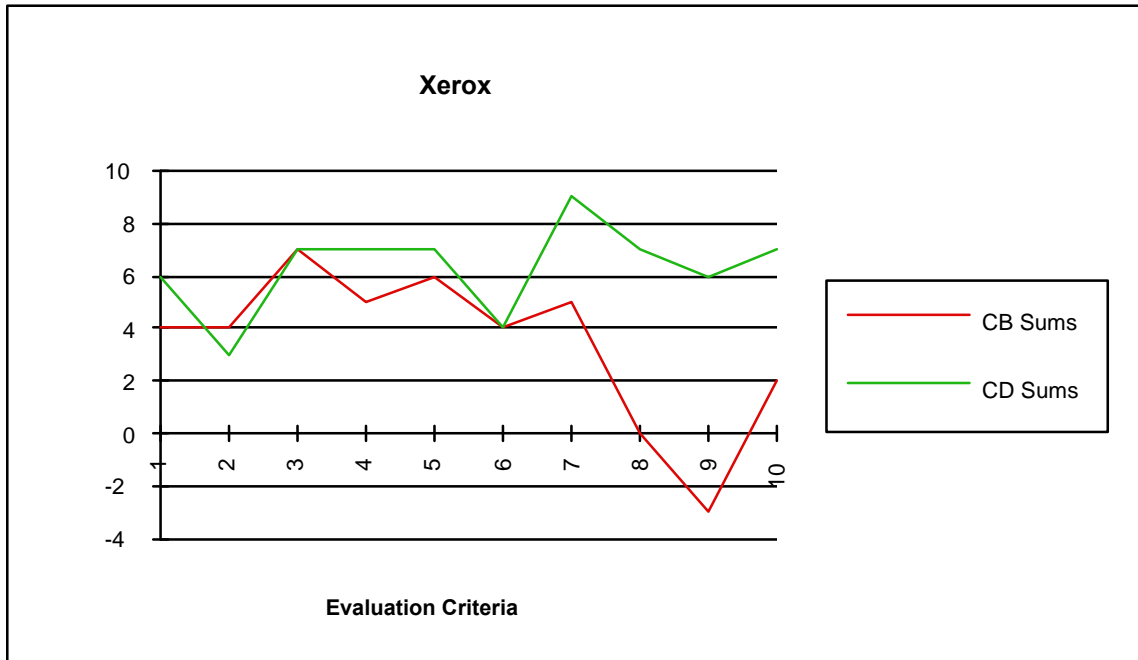
The case brief learning organization attribute results compare the reviewer case brief scores to the six (1-6) learning organization attributes.



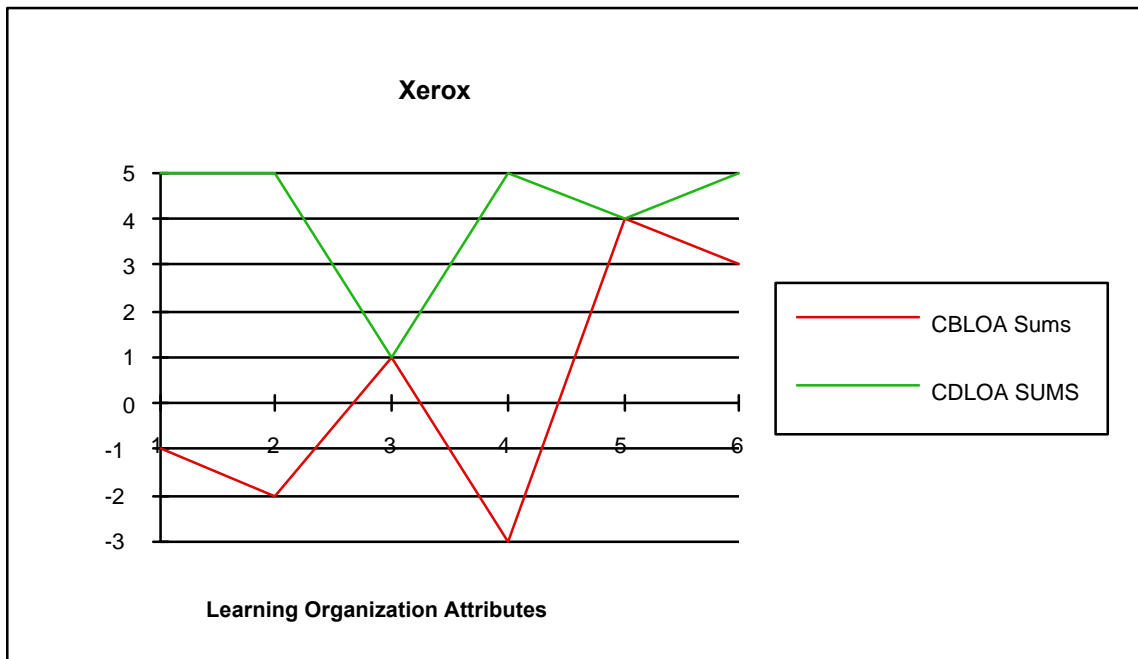
The causal diagram results compare the reviewer scores to the ten (1-10) causal diagram criteria.



The causal diagram learning organization attribute results compare the reviewer causal diagram scores to the six (1-6) learning organization attributes.



The Xerox Case Brief versus Causal Diagram Criteria Results are compared to the ten (1-10) criteria categories.



The Xerox Case Brief Learning Organization Attributes versus Causal Diagram Learning Organization Attributes are compared to the six (1-6) criteria categories.

5. Summary, Discussion, and Recommendations

The study, on a preliminary basis, shows that case briefs and causal diagrams do work together in a collaborative manner to provide insight to business decisions in a learning environment. Given the

attributes of a learning organization, case briefs and causal diagrams compliment each other, combining their separate relative strengths.

Case Briefs:

1. Reviewers were comfortable with the Xerox case brief satisfying the basic elements representing the case, e.g., facts, issue, and decision [Case Brief Criteria 1-5].
2. There was agreement among the reviewers that the case brief corroborates the causal diagram [Case Brief Criteria 6].
3. Reviewers indicate that the case briefs definitely present unique information as compared to the causal diagram [Case Brief Criteria 7].
4. In general, the reviewers did not believe that the case brief supports the learning organization attributes directly or indirectly [Case Brief Criteria 8-9].
5. The reviewers were satisfied that the case brief did set the stage for further study [Case Brief Criteria 10].

Causal Diagram

1. The reviewers were positive in scoring the causal diagram as representing the case brief as a mental model, case facts, and the "issue" as a feedback loop [Causal Diagram Criteria 1-3].
2. There were consistent acknowledgments that amplification and delay factors were present in the causal diagrams [Causal Diagram Criteria 4-5].
3. The reviewers affirmed that the causal diagram corroborated the case brief [Causal Diagram Criteria 6].
4. There was strong agreement that the causal diagram highlighted unique influencing factors as compared to the case brief [Causal Diagram Criteria 7].
5. In contrast to the case brief, the reviewers were very positive that the causal diagram supported the learning organization attributes [Causal Diagram Criteria 8-9].
6. In contrast to the case brief, the reviewers were consistently more positive that the causal diagrams set the stage for further insight through simulating the case [Causal Diagram Criteria 10].

Learning Organization Attributes:

With regard to the six clustered Learning Organization Attributes, the scoring trends were as follow:

1. The reviewers consistently felt that the Xerox causal diagrams supported "Total System Perspective", "Performance & Practice" and "Experimental Mindset" [Causal Diagram Learning Organization Attribute 1, 2 and 4], whereas the case brief did not [Case Brief Learning Organization Attribute 1, 2 and 4].
2. The reviewers were nearly "unanimous" that neither the case brief nor the causal diagrams were supportive of the "Servant Leader" attribute [Case Brief Learning Organization Attribute 3; Causal Diagram Learning Organization Attribute 3].
3. In general, the reviewers were comfortable that both case briefs and causal diagrams supported the "Shared Problem Solving" and the "Shared Vision" attributes [Case Brief Learning Organization Attribute 5 and 6; Causal Diagram Learning Organization Attribute 5 and 6].

6. Conclusive Results

The following conclusive results are evident from the study preliminary findings:

1. The case brief and causal diagram do corroborate each other and affirm the essential lessons of the case.
2. The causal diagram highlights unique influencing factors as compared to the case brief.
3. The causal diagram was found to be more supportive of learning organization attributes than the case brief.
4. The reviewers did not find the "Servant Leader" learning organization attribute relevant to the case.

Both the case brief and causal diagram encourage further study and analysis in order to understand the case.

Bibliography

- Argyris, C & Schön, D.A. (1978) . Organizational learning: A theory of action perspective. Reading, MA: Addison-Wesley.
- Cash, J, McFarlan, F., McKenney, J., Applegate, L. (1992) . Corporate information systems management: text and cases. Illinois: Irwin.
- Dixon, N. (1993) . Organizational learning. Ottawa: Conference Board of Canada Report 111-93.
- Dodgson, M. (1993) . Organizational learning: A review of some literature. Organization Studies, 14/3, 375-394.
- Fiol, C.M., & Lyles, M.A. (1985) . Organizational learning. Academy of Management Review, 10/4, 803-813.
- Forrester, J. W. (1992) . System dynamics and learner-centered-learning in kindergarten through 12th grade education (D-#4337), Systems Dynamics Group, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA, (pp.1-20).
- Forrester, J. W. (1991) . Systems dynamics and the lessons of 35 years. In Kenyon B. De Greene (Ed.), Systemic basis of policy making in the 1990s (pp. 5-34). [<http://fnet.ils.unc.edu/~gotwals/stella/sdg/sdlessons.txt>].
- Hahn, P. (1996) . Introduction to the case study method, [<http://128.146.140.187/ae601/hahnpam.html>].
- Huber, G. P. (1991) . Organizational learning: The contributing processes and the literature. Organization Science, 2/1, 88-115.
- Huff, S. L., Tawfik, J., Cash, J., & Pifko, J. (1996) . Teaching information systems management with cases, 1-6, [<http://www.business.uwo.ca/~isworld/article.html>].
- Kofman, F., & Senge, P. (1995) . Communities of commitment: The heart of the learning organization. In Sarita Chawla & John Renesch (Eds.), Learning Organizations (pp. 15-43). Productivity Press: Portland, OR.
- Nevis, C., DiBella, J, & Gould, M. (1995) . Understanding organizations as learning systems. Sloan Management Review, Winter, 73-85.
- Senge, P. M. (1990) . The fifth discipline: the art & practice of the learning organization. New York: Doubleday/Currency.
- Sprague, H. & McNurlin, C. (1993) . Information systems management in practice. New Jersey: Prentice Hall.
- Wolstenholme, E. F. (1990) . System enquiry: A system dynamic approach. Chicester: Wiley & Sons.