

THE ROLE OF INFORMATION TECHNOLOGY

IN A LEARNING ORGANIZATION: Case Study and Causal Diagramming

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Introduction

The quest for profit in the competitive marketplace requires businesses to leverage capabilities at every opportunity. Many businesses use information technology as a strategic asset to improve their competitive positions. In the context of this study, information technology includes the technologies of computers and telecommunications (hardware and software), (Sprague & McNurlin, 1993).

In contrast to computers and telecommunications, case study has provided a low technology method to learn about business capabilities. Case study has produced insights that help businesses leverage or avoid situations similar to those documented in business cases. Presently, a typical way that decision makers are trained to prepare for business careers is learning through the case study of hypothetical or actual business situations. In general, the case study process involves reading the case text to determine the facts of the case, the issue or problem, the business decision, and lastly, some reasoning as to whether the decision is supported by the factual results of the case from the reader's perspective.

With the advent of computerized information systems, a new tool is available to help businesses use information technology and case study as a competitive, strategic asset, System Dynamics. According to Wolstenholme (1990), System Dynamics is a rigorous method for qualitative description, exploitation and analysis of complex systems in terms of their processes, information, organizational boundaries and strategies. Additionally, System Dynamics facilitates quantitative simulation modeling and analysis for the design of the system structure and control.

Within System Dynamics, causal diagramming offers a convenient way to represent the structure and behavior of systems composed of interacting feedback loops. Causal diagrams identify the principle feedback loops without distinguishing between the nature of the interconnected variables. These diagrams play two important roles in System Dynamics:

1. They serve as preliminary sketches of causal hypothesis during model development.
2. They can simplify the illustration of the model as a mental model.

In both roles, causal diagrams will allow the business analyst to quickly communicate the structural assumptions underlying a case study. The combination of causal diagramming and case study will support the business analyst in achieving a systemic view of a business to learn more about its fundamental attributes and characteristics.

The effective use of case study and causal diagrams fits well in a learning organization framework that requires a consistent examination of the whole business system, rather than just trying to fix isolated problems. According to Dodgson (1993), a learning organization is a business that purposefully constructs structure and strategies to enhance and maximize organizational learning.

The fifth discipline uses this conceptual framework of examination of the whole and tools of systems thinking to clarify problems to understand how to change them most effectively, Senge (1990). System Dynamics readily lends itself to learning organization environments in this context. Forrester (1991) describes System Dynamics as the theory, method, and philosophy needed to analyze the behavior of systems in not only business, but also in environmental change, politics, economic behavior, medicine, engineering, and other fields using simulation technology.

Statement Of The Problem

Businesses need to continuously find better and faster ways to adapt to the competitive marketplace in order to compete in today's high technology and fast paced environment. Learning organizations provide a framework that encourages finding better and faster ways to adapt in today's high technology and fast paced world by:

1. Looking at the 'whole' vs. the 'parts', a systemic perspective
2. Detecting and correcting errors
3. Improving actions through knowledge, and
4. Developing the broad skills of their work-force.

Businesses that are 'learning organizations' will capitalize upon techniques and tools that improve competitiveness.

A learning organization that uses case study and causal diagramming to inquire into the systemic consequences of their plans or actions will potentially improve its competitive nature.

Case study represents a vast source of past business knowledge available for learning. Causal diagrams will help the business analyst identify the major influencing factors of a case study 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.

Brief Description Of The Research Method And Design

A comparison of a case study and its causal diagram was performed to illustrate the collaborative role of information technology in a learning organization to test the study hypothesis.

The methodology consisted of the following procedures:

1. Determined the attributes of a learning organization as defined and referenced in the research material. This is the work of Argyris and Schön (1978), Fiol and Lyles (1985), Dodgson (1993), Kofman and Senge (1995), Nevis et al. (1995), and Senge (1990). Once a list of the attributes of a learning organization for each author was established, an analysis of common and unique attributes was conducted. This procedure established a basis for determining what is a learning organization based on a set of shared attributes. This set of attributes was needed in order to support the next steps of the methodology.
2. Reviewed case study material to identify the attributes of a case study. Briefed the case in order to gather case study results in a uniform manner for comparison to the causal diagram.
3. Reviewed the System Dynamics material to identify the attributes of causal diagrams. Diagrammed the case for comparison to the case brief.
4. Compared the case brief and causal diagram to determine their collaborative role in satisfying the attributes of a learning organization.

The Xerox case study was selected for the purposes of this study, Cash et al. (1992). After completing the case brief and causal diagram, the results were compared to each other and to the learning organization attributes to determine the collaborative manner in which the two methods complement a learning organization.

Major Findings And Their Significance

As a starting point, this study adopts the definition of a learning organization as an enterprise that purposefully configures itself to improve its future performance by learning from its past and current experience. Based on the literature, there is a set of characteristics that describe learning organizations. These characteristics were derived from attributes of learning organizations as discussed by various authors; they are summarized in Figure 1. Related attributes were clustered based on similar features. Each cluster represents a distinguishing characteristic of a learning organization. For example, attributes such as "Inquire into systemic consequences" (6), "Acknowledge primacy of whole v. pieces" (9), "Facilitate-systems perspective (systemic relationships)" (26) and "Systems thinking (exam whole v. parts)" (31) from Figure 1 are clustered as the distinguishing characteristic - 1.0 "Total Systems Perspective", Table 1, below.

| | Attributes | Senge | Nevis | Kofman & Senge | Dodgson | Fiol & Lyles | Argyris & Schon |
|----|---|-------|-------|----------------|---------|--------------|-----------------|
| 1 | Detect & Correct Errors | | | | | | Yes |
| 2 | Act on knowledge & understanding | | | | | Yes | |
| 3 | Constructs structures & strategies to improve organizational & workforce skills | | | | Yes | | |
| 4 | Build community of servant leaders | | | Yes | | | |
| 5 | Arise through performance and practice | | | Yes | | | |
| 6 | Inquire into systemic consequences | | | Yes | | | |
| 8 | Use "managerial practice fields" | | | Yes | | | |
| 9 | Acknowledge primacy of whole v. pieces | | | Yes | | | |
| 10 | Use nonlinear thinking | | | Yes | | | |
| 17 | Facilitate-scanning imperative (aware of environment) | | Yes | | | | |
| 18 | Facilitate-performance gap (actual v. desired state) | | Yes | | | | |
| 19 | Facilitate-measurement (strive to quantify) | | Yes | | | | |
| 20 | Facilitate-experimental mindset (act like researcher) | | Yes | | | | |
| 21 | Facilitate-open climate (share problem/error/lesson) | | Yes | | | | |
| 22 | Facilitate-education (sense that learning is never over) | | Yes | | | | |
| 23 | Facilitate-operational variety (diversity v. singularity) | | Yes | | | | |

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|----|--|-----|-----|--|--|--|--|--|
| 24 | Facilitate-multiple advocates (no one champion) | | Yes | | | | | |
| 25 | Facilitate-involved leaders (engage in vision actions) | | Yes | | | | | |
| 26 | Facilitate-systems perspective (systemic relationships) | | Yes | | | | | |
| 27 | Team Learning (suspend assumptions & think freely) | Yes | | | | | | |
| 28 | Build Shared Vision (truly shared picture of the future) | Yes | | | | | | |
| 29 | Mental Models (separate the map from the territory) | Yes | | | | | | |
| 30 | Personal Mastery (to be the best possible) | Yes | | | | | | |
| 31 | Systems Thinking (exam whole v. parts) | Yes | | | | | | |

Figure 1 Summary of Learning Organization Attributes by Author

- 1.0 Total Systems Perspective (6, 9, 26, 31, 10)
 - 1.1 Inquire into systemic consequences (6)
 - 1.2 Acknowledge primacy of whole v. pieces (9)
 - 1.3 Facilitate systems perspective (systemic relationships) (26)
 - 1.4 Systems thinking (exam whole vs. parts) (31)
 - 1.5 Facilitate-scanning imperative (aware of environment) (17)
 - 1.6 Use nonlinear thinking (10)
- 2.0 Performance and Practice (1, 5, 18, 2)
 - 2.1 Detect and correct errors (1)
 - 2.2 Arise through performance and practice (5)
 - 2.3 Facilitate performance-gap (actual v. desired state) (18)
 - 2.4 Act on knowledge and understanding (2)
- 3.0 Servant Leaders (4, 24, 7, 3, 25)
 - 3.1 Build community of servant leaders (4)
 - 3.2 Facilitate-multiple advocates (no one champion) (24)
 - 3.3 Construct structures and strategies (organization & workforce skills) (3)
 - 3.4 Facilitate-involved leaders (engage in vision actions) (25)
- 4.0 Experimental Mindset (8, 19, 20)
 - 4.1 Use managerial practice fields (8)
 - 4.2 Facilitate-measurement (strive to quantify) (19)
 - 4.3 Facilitate-experimental mindset (act like a researcher) (20)
- 5.0 Shared Problem Solving (21, 22, 27, 23)
 - 5.1 Facilitate-open climate (share problem/error/lesson) (21)
 - 5.2 Facilitate-education (sense that learning is never over) (22)
 - 5.3 Team learning (suspend assumptions & think freely) (27)
 - 5.4 Personal Mastery (to be the best possible) (30)
- 6.0 Shared Vision (23, 28, 29)
 - 6.1 Facilitate-operational variety (diversity v. singularity) (23)
 - 6.2 Build Shared Vision (truly shared picture of the future) (28)

6.3 Mental Models (separate the map from the territory) (29)

Table 1 Clustered Attributes of a Learning Organization

Next, the case, Xerox Corporation: Leadership of the Information Technology Function (A), was briefed. The brief is presented below as Figure 2.

Facts:

1. In 1970s key patents expired and Xerox faced increased competition.
2. In 1980s Japan sold copiers for what it cost Xerox to make them.
3. In 1986 Business Products and Systems Group (BPSG) accounted for \$9.4B in revenue (72%).
4. In 1986 Financial Services (FS) accounted for 28% of total revenue.
5. In 1986 FS's profit of \$278M exceeded for the first time BPSG's profit contribution.
6. Corporate Information Management (CIM) mission was to develop Information Technology (IT) strategy role to ensure implementation by all business units.
7. BPSG segment developed, manufactured, marketed and serviced a complete range of document-processing products.
8. FS division provided financial products and services.
9. There was no clear definition of the responsibilities of the centralized CIM group and the decentralized business units.
10. Barron became Director of CIM in 1987.
11. The IS budget was \$500M with a growth rate of 20% per year.
12. CIM had two sets of customers: Corporate management and BPSG.
13. CIM provided consulting services, as requested, to FS.
14. Corporate management expected CIM to ensure that the \$500M IT budget was well spent.
15. Business managers (BPSG) resented CIM auditing how IT \$ were spent.
16. CIM managers felt they should be advocates for how IT \$ were spent, e.g., support and visibility to Corporate.
17. Barron created a new CIM mission statement in 1988 to emphasize "people development", and an IT and Business Advocacy Role for CIM.

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

Decision: Yes. Allaire will endorse Barron's new mission statement.

Reasoning:

1. The CIM vision statement supports Allaire's position that more and better IS/Business capable staff be added, the Advocacy Role to develop more and better business savvy information technologists.
2. The CIM statement essentially represents a status quo in the short term for BPSG.
3. The statement does not change corporate management's position that CIM ensure proper use of its \$500M.
4. The statement leaves FS alone except for providing them consulting services as requested.
5. The statement continues to support Executive Support System (ESS) for Corporate Management.

Lastly, the Xerox case was diagrammed as illustrated below in Figure 2. The causal diagram presents three feedback loops that affect the corporate profit. The first one represents the negative impact of CIM's role considering the new mission statement relative to IT Strategy, Business Unit Revenue and Profit. The negative impact that this loop has on Profit is a major, internal to Xerox, reason that the new mission statement emphasizes the Advocacy Role to improve business knowledge by the technologist in the CIM organization. The second loop, which represents the issue of the case, shows that the new CIM mission statement positively impacts the Advocacy Role which in kind positively impacts the Business Unit revenue that still results in a Profit decrease. This last deduction is conjecture since there are no facts in the case to substantiate the result one way or another. At minimum, there will be some significant time delay before there is an increase in Profit, considering the magnitude of revenue increase required to make Profit positive. Based on the case, the Business Unit profit was \$240M on \$9.4B in revenue (\$7B of which was from copier sales) or 2.6% Return on Sales. Financial Services' profit was \$278M based on an estimated \$3.6B, or 7.7% Return on Sales. The Business Unit's ability to generate enough revenue to approach 7.7% Return on Sales or to cut costs enough to improve the profit margin to approach the same return on sales is dramatic; therefore, supportive of the deduction that the Business Unit's contribution to profit will continue negative in the near term. Moving the causal diagram to a System Dynamics model would support what-if scenarios and a managerial practice field approach to learning about the problem. As it is, Xerox appears to believe that the change in CIM's mission statement will move them along the way to improved business operations and profit. Lastly, the Financial Services loop shows that as Financial Services revenue increases so does its contribution to profit; this is supported by the case facts. It appears that the primary influencing factor on the Business Unit's profit is the loss of patent rights by expiration. The subsequent loss of market share has directly impacted Xerox's Business Unit profitability and will continue to have a significant effect based on the case information that competitors sell copiers at prices that it costs Xerox to build them.

Xerox Case Causal Diagram

Conclusions

Case study and causal diagrams will collaboratively affect a learning organization's ability to adapt to competitive situations. For the Xerox case, both case study and causal diagramming provide insights to the problem at hand. The case approach as presented in the brief clearly frames the Xerox facts and issue. The causal diagram presents a picture of the case dynamics and the role the new mission statement will play relative to profit. Taken together, it is easier to see that the act of writing the new mission statement may have little influence on the course of the Business Unit's profitability; however, more detail with direct regard to revenue generation and profit margin are needed. Similarly, both approaches recognize that Financial Services is a profit maker; some may say it is more clearly evident from the causal diagram than the case brief. One might speculate that failure to recognize the potential of Financial Services to impact profit may be an opportunity lost.

Comparing case study and causal diagramming to the learning organization attributes of Table 2 shows that both techniques complement each other in some instances. Table 3 presents a comparison of their collaborative nature for the Xerox case.

| 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 |

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