LIMITS TO CHANGE IN IS IMPLEMENTATION: A STUDY OF SMALL BUSINESS

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ABSTRACT

Given the current e-commerce environment small business success often depends on IS-enabled change. Small businesses rely on IS-enabled changes to enhance cooperation and alignment among themselves and to achieve benefits from information technology. The literature identifies factors of resistance to IS-enabled change as human, political, and technical. A key result of this paper is that knowledge management is also a factor of resistance and may negatively impact IS. A qualitative case study of IS implementation in small businesses was employed to identify factors that influence planned technical and work process changes. Through case study analysis resistance factors surfaced that limited the planned changes. System dynamics helped us in exploring the complexity of the relationship among limiting conditions. A conceptual model is presented to help IS managers understand how limiting plateaus develop when implementing new technology in small business.

Keywords: IS implementation, resistance to change, system dynamics, case study, small business

INTRODUCTION

Small business success, even survival, depends on IS-enabled change. The proliferation of the World Wide Web requires small businesses to use sophisticated network and communication technologies. Small businesses achieve benefits from using these technologies by making adjustments to business processes. Additionally, many large companies can now tap into markets once reserved for small firms by customizing their products (3). This increased competition requires small businesses to find new ways of competing. They may rely on IS-enabled changes to enhance cooperation and alignment among themselves (19).

The literature identifies factors of resistance to IS-enabled change as technical, political, and human (8, 10, 17). A key result of this paper is that knowledge management is also a factor of resistance and may negatively impact IS. This result extends the findings of studies that investigate the relationship between knowledge management and IS success (9, 13). Data from the case study indicate that the interaction of resistance factors, which are knowledge management, political and human, limit the change that a small business may expect from an IS initiative.

The paper is organized as follows: First, relevant literature is reviewed that identifies factors of resistance to IS-enabled change. Then the qualitative methodology is presented. Next, a system dynamics modeling approach is introduced. Case data are analyzed in terms of planned changes, actual changes, and dominant limiting factors. Finally, a conceptual model is presented that may...
help IS managers understand how limiting plateaus develop when implementing new technology in small business.

**RESISTANCE TO CHANGE**

Technical, political, and human resistance factors impede the ability of an organization to achieve planned IS-enabled change (8,10,17). Some of the resistance may arise from system related problems. One approach is to ‘tweak’ the system to fix these problems and satisfy user complaints. Another possible action, to remedy the resistance, is to mix resistors with non-resistors (10). The different backgrounds of people (i.e., resistors and non-resistors) hinder their ability to transfer implicit knowledge among themselves. Managers that employ this human resource approach should be aware of the communication issues that may surface. Therefore, organizations may have to assess the appropriate level of detail when codifying knowledge in an explicit form.

Another reason for resistance to IS-enabled change reflects a political dimension. Political resistance refers to end users’ fear of losing power and status due to the codification of information. The ability to share information that is organized and stored in various repositories, such as in a database or an expert system, structurally constrains power (11,12). Furthermore, system development activities force parties to “confront each other either directly or indirectly”(17). This method of exchange, which is constrained by political agendas, has the potential to limit change in an organization.

From a human perspective, resistance may develop when end users perceive that they will lose their jobs or be reassigned to new responsibilities (7). Additionally, when learning new IS features end users may become dependent on their co-workers. This dependency develops when trust is established among the co-workers. Since it takes time to build trust, change may not be immediately realized (7,10).

**METHODOLOGY**

A multiple case study approach was chosen to understand how limiting conditions develop and how they affect the planned outcomes of the IS implementation (5,14). According to Yin (20), case study is the preferred research method when the focus is on a contemporary setting over which the investigator has little or no control and when “how” questions are being posed. Case study research focuses on understanding the dynamics present within single settings (4), such as gaining insight into the reasons why expected planned changes are often not achieved in IS implementations. In this study, we combine a system dynamics modeling approach with a qualitative investigation in order to help explain the complex interaction among limiting conditions.

**Data Collection and Analysis**

An initial pool of fifty MIS specialists was formed from lists supplied by the Association of Management Consultants, by the IT Consultants and Contractors World Conference, and from professional contacts. Twenty MIS specialists were chosen at random. The Appendix shows case data by industry sector and type of IS.
This study used open-ended interviewing as the primary data collection method. Additionally, observations, documents, and scripts from an Internet-based discussion group further supported the study. Employing multiple data collection methods resulted in achieving triangulation.

Data analysis was conducted by organizing information obtained from the interviews, observations, and discussion group. The interpretation of the data revealed a pattern of factors that led to the resistance of IS-enabled change in the small businesses. Relationships among the dominant factors emerged, which indicated that a unique interaction existed between them. In order to control for bias, the researchers continually questioned the analyses and searched for negative instances of the phenomenon (6). These findings were represented using a system dynamics modeling approach (15), which facilitated the transition from interpretation to conclusion.

**DISCUSSION**

The appendix shows case data by planned change, actual change, and the dominant limiting factors. The limiting factors were identified in the cases and showed systematic patterns of similarities in three categories, which are human, knowledge management and political.

**Conceptual Model**

The conceptual modeling approach based on system dynamics can be applied to understand how variables interact in a decision making situation, especially when expected goals are not at planned levels (1,2,15). In this paper, a system dynamics approach is used to help uncover the “stumbling blocks” to IS-enabled change in small business (see Figure 1).

The causal loop diagram represents the causal relationship between variables, which are linked by arrows. The variables that appear at the tail and at the point of the arrow may participate in either a positive (+) or negative (-) relationship. A positive causal relationship occurs when both variables increase or decrease in the same direction. For example, an increase (decrease) in the variable ‘IS-enabled change’ will increase (decrease) the variable ‘level of planned change’. This is because a positive reinforcement results in creating a desire to accomplish even more. A negative causal relationship indicates that the variables change in opposite directions. This occurs when an increase in one variable causes a decrease in the other variable (18). For example, an increase (decrease) in the level of ‘limiting conditions’ (i.e., knowledge management, human, and political) will decrease (increase) ‘planned IS-enabled change.’

The feedback loops can take two forms: Negative (balancing) or positive (reinforcing). Balancing feedback indicates a stabilizing structure arising from a goal-oriented behavior. In other words, we take actions to improve our performance whenever there is a difference between what we want and what we have. The 'goal' can be explicit, such as a desired level of change, or it could be implicit, such as an acceptable level of decision effectiveness. A positive loop indicates a reinforcing process in that the effects of the initial variable are amplified resulting in further escalation of the initial variable. Usually, the reinforcing loop accelerates an increase, such as growth of companies or accelerates a decline, such as extinction of corporations (15,16).
Based on case data and analysis, a conceptual model was developed, as presented in Figure 1. The figure illustrates that organizations will likely plan and implement additional IS projects after initial success in their change efforts. End users see positive results from the changes such as a better user interface, improved customer support, and effective business processes. These results encourage further change. Hence, this is a reinforcing (+) loop. However, this initial success meets some limiting conditions. The greater the initial change, the more the limiting factors operate on the planned goals. Eventually, change efforts reach a plateau as reflected by the balancing (-) loop. An inability to achieve the planned change requires management to address the limiting conditions.

Figure 1. Causal Loop Diagram: IS-enabled Change in Small Business

Limiting Factors
The knowledge management factor refers to a mismatch between implicit organizational knowledge and its explicit representation in physical artifacts. Political factors are present when systems that centralize control over data are resisted in organizations with decentralized authority structures or when systems that alter the balance of power are resisted by those who lose power. Finally, human resistance develops from an incompatibility between system design and user expectations. Figure 2 presents the three categories of resistance and shows how they interact during IS implementation.

For example, in case 2, a subsidiary of a shipping company, IS-enabled changes required constant updates of knowledge management structures. The level of detail in knowledge management artifacts should mirror and maintain the implicit changes that take place in an organization. For example, changes in end user responsibilities and the addition of new procedures were not adequately documented. Lack of detail in these documents led to ambiguity and an opportunity for political maneuvering by different participants in the organization. On the other hand, explicit documentation for every possible scenario would have required the use of resources (i.e., time, personnel, storage) that would be costly, although the advantage is that political abuse will be less likely. Although the knowledge management program offered flexibility, it reinforced political agendas that interfered with business, and the planned IS...
Changes were not achieved. This strengthened political force interacted with human factors, such as trust, and impeded the willingness of employees to formalize changes that could have increased the effectiveness of knowledge management efforts and acceptance of new technology.

**Figure 2. Interactions Among Limiting Factors to IS-enabled Change**

![Figure 2. Interactions Among Limiting Factors to IS-enabled Change](image)

**CONCLUSION**

This paper introduced a conceptual modeling approach that combines qualitative research with system dynamics modeling. The approach helps to crystallize issues related to IS-enabled change in small businesses. Small businesses that are resource poor may rely on IS professionals to manage all aspects of implementation that include human, political, and technical. This paper suggests that IS professionals should also address knowledge management issues. Additionally, the predominant view that knowledge management only conveys positive benefits to an organization may have to be rethought.

Small business managers are disappointed when their IS implementations reach a limiting plateau. Modeling the limiting conditions using a systems framework enables the analysis of these factors and their interactions. Factors that negatively impact IS-enabled change will hinder future IS plans, unless the limiting conditions are recognized early on and managed.
REFERENCES

## APPENDIX: CASE DATA

<table>
<thead>
<tr>
<th>#</th>
<th>Industry Sector; Type of IS</th>
<th>Planned Change</th>
<th>Actual Change</th>
<th>Dominant Limiting Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Service: education; PC lab</td>
<td>· People's views · Technology</td>
<td>· Formation of computer committee · Installed computer lab</td>
<td>Human.</td>
</tr>
<tr>
<td>2</td>
<td>Service: shipping; MIS</td>
<td>· Intra-company power arrangements and empowerment</td>
<td>· Hiring of consultant company to reorganize organizational chart · Start changing business processes</td>
<td>Knowledge Mgmt; Political</td>
</tr>
<tr>
<td>3</td>
<td>Service: real estate; IS</td>
<td>· Work processes · User mind set</td>
<td>· Information System</td>
<td>Knowledge Mgmt; Human</td>
</tr>
<tr>
<td>4</td>
<td>Manufacturing: Doors; MRP</td>
<td>· Move from legacy system to client-server</td>
<td>· Change in business flow · Hiring internal project manager · Information Technology</td>
<td>Political</td>
</tr>
<tr>
<td>5</td>
<td>Manufacturing: Chemicals; MRP</td>
<td>· Improved inventory data</td>
<td>· Changes in production planning · Increase of 40% inventory turnover</td>
<td>None identified</td>
</tr>
<tr>
<td>6</td>
<td>Service: advertising; MIS</td>
<td>· Improvement of IS</td>
<td>· Increase inventory accuracy &gt; 90%</td>
<td>None identified</td>
</tr>
<tr>
<td>7</td>
<td>Service: communication; Data mining</td>
<td>· New IS and awareness of advanced IT</td>
<td>· Development of client capabilities on MARCOLA (mid-level system) for eventual move to SAP</td>
<td>None identified</td>
</tr>
<tr>
<td>8</td>
<td>Service: retail distributor; AIS</td>
<td>· Automate IS · Improve efficiency</td>
<td>· Assistance to decision makers to recognize problem areas</td>
<td>None identified</td>
</tr>
<tr>
<td>9</td>
<td>Service: banking; IT</td>
<td>· IT upgrade</td>
<td>· Employee promotions · Change in accounting procedures</td>
<td>Knowledge Mgmt; Political</td>
</tr>
<tr>
<td>10</td>
<td>Service: National Guard; MIS</td>
<td>· Business focus · Tools for reporting</td>
<td>· Change in thinking about new IT · New IS and EIS systems</td>
<td>None identified</td>
</tr>
<tr>
<td>11</td>
<td>Service: Financial; IS</td>
<td>· Paradigm shift from manual to automated</td>
<td>· Increase in awareness of IS · Improvement in productivity</td>
<td>Human</td>
</tr>
<tr>
<td>12</td>
<td>Service: Financial; IS</td>
<td>· Change of existing IS processes</td>
<td>· Work simplification and increased accuracy</td>
<td>Political</td>
</tr>
<tr>
<td>13</td>
<td>Manufacturing: pool supply; MIS</td>
<td>· Business practices and approach to planning</td>
<td>· Increase in demand for and expectation of IS</td>
<td>None identified</td>
</tr>
<tr>
<td>14</td>
<td>Manufacturing: Home goods; ERP</td>
<td>· Process and structure · People's views</td>
<td>· Teaching client to base position on facts not on preconceived ideas</td>
<td>Knowledge Mgmt; Political</td>
</tr>
<tr>
<td>15</td>
<td>Service: Fashion importer; DBMS</td>
<td>· Data warehouse</td>
<td>· Formation of effective work teams · Improved performance analysis</td>
<td>Knowledge Mgmt; Political</td>
</tr>
<tr>
<td>16</td>
<td>Service: fashion retailer; ERP</td>
<td>· Return employees to original job function</td>
<td>· Identification of internal IS champion</td>
<td>Political</td>
</tr>
<tr>
<td>17</td>
<td>Service: medical society; Intranet</td>
<td>· Business model · On-line community</td>
<td>· Creation of on-line web site</td>
<td>Knowledge Mgmt; Human</td>
</tr>
<tr>
<td>18</td>
<td>Non-profit: humanitarian; IS</td>
<td>· PC-based GUI · End-hand drawn maps</td>
<td>· Adoption of GUI in daily operations</td>
<td>None identified</td>
</tr>
<tr>
<td>19</td>
<td>Service: IT operations; IT infrastructure</td>
<td>· Move world-wide network · Empowerment</td>
<td>· Move IS operations · New IT · Team capability for change</td>
<td>Political</td>
</tr>
<tr>
<td>20</td>
<td>Service: Nat’l org. for community and justice; WAN</td>
<td>· Change of IS · Change of culture</td>
<td>· Rolling out web site · Users view about info. system · Addition of IS budget</td>
<td>None identified</td>
</tr>
</tbody>
</table>

**Human**: Human acceptance of technology not accomplished, requires change in mindset. System Design not compatible with human-computer interface envisioned. **Political**: Client side champion and political gesturing; implicit changes to status, responsibility and power arrangements. **Knowledge Management**: Importance of codifying implicit knowledge.