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International Conference on Information Resources Management (CONF-IRM)

5-2009

Problem Analysis: When Established Techniques Don't Work

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8. PROBLEM ANALYSIS: WHEN ESTABLISHED TECHNIQUES DON'T WORK

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Abstract

An action research project was conducted to develop a 360-degree evaluation of an information technology organization for which existing process improvement techniques did not fit. A three-by-three matrix was developed that suited the complexity of the context yet provided a means for discussion the issues with the organization's Executive Committee.

Keywords:

Problem Analysis, Ishikawa Diagram, Matrix Analysis

1. Introduction

Process improvement projects apply process mapping (Author, 2007), quality (Deming, 1986, 2008), and six-sigma (Six Sigma, 2008) tenets to document, analyze, and improve organizational functioning. When the process under review is an Information Technology (IT) organization, frameworks such as the Capability Maturity Model (CMMI, 2004), Control Objectives for Information and Technology (CobiT, 2007), and the Information Technology Infrastructure Library (ITIL, 2005) also apply.

Quality management tenets are used to analyze problem areas to determine areas for further investigation, root causes of problems, or other aspects of problems. The seven basic tools of quality management are considered to include flow or process diagrams, check sheets, Pareto diagrams, Ishikawa diagrams, histograms (or other graphic data summarization methods), scatter diagrams, and control charts (for statistical process control processes) (Author, Forthcoming; Sahni, 1998, p. 1; Wikipedia, 2008). Of these techniques, Ishikawa diagrams can be used for all purposes and are versatile in usefulness for problem identification, analysis, and solving.

The Ishikawa diagram, named for its creator Kaoru Ishikawa, is also known as a fishbone or cause-and-effect diagram. (Anderson, 1999). The most common use of Ishikawa diagrams is to enumerate causes of problems. A basis Ishikawa diagram (Figure 1) shows the problem being analyzed with *bones* drawn from the main problem axis and labeled with generic problem categories such as "people, machines, materials, methods, measures, [and] environment" (Anderson, 1999, p. 75) or "surroundings, suppliers, systems, [and] skills" (4 Ss, Wikipedia, 2008) or price, promotion, people, processes, place /plant, policies, procedures, and product (5 Ps, Wikipedia, 2008). Causes of the problem for each category are written on lines that are drawn from each *bone*.

Development of the causes can be done using a variety of techniques. Two of the most common are brainstorming and root cause analysis. Brainstorming is useful when trying to define problems to be mitigated during design of a process or product. Root cause analysis is useful when trying to determine the cause(s) of an event or critical incident. Causes can be further decomposed to develop sub-causes, contributing factors, or aspects of causes that might otherwise be missed. Once the diagram is complete, each cause is further defined to develop mitigation plans or otherwise plan to remedy an existing defect.

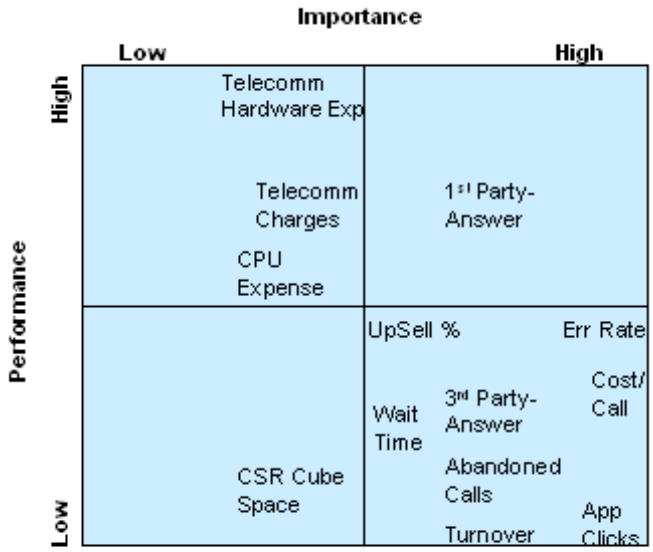

Figure 2. Matrix Summary of Call Center Measures

A second technique frequently used in problem understanding and analysis is the 2x2 matrix (See Figure 2). Matrices are used to identify key alternatives for analyzing a situation. They are easily understood and, therefore, deceptively simple. The 2x2 matrix is useful for analyzing risk-reward, cost-benefit, revenue-cost, product-market, economies of speed-scope, urgency-importance, importance-performance, and any number of other dyadic relationships (Covey, 2004; Author, Forthcoming; Lowe and Hood, 2004). Entries in a 2x2 matrix can be words, graphics, circles for which size is determined by a third factor, or dots to represent the entries. Both entry of items in the matrix and analysis of matrix entries typically are a group exercise for decision-making.

Both Ishikawa diagrams and 2x2 matrices are prone to the same disadvantages in that they both rely on the expertise of the individuals completing the graphic to be meaningful. Further, they can omit critical information if the information is unknown to the individuals completing the graphics. The advantages of the two techniques are that they require no special technology, little training, and can be customized to a specific context (Author, Forthcoming). Ishikawa diagrams and 2x2 matrices are believed to be useful in most situations and, with this understanding, the team conducting the IT organization review had planned to use them as a primary method for problem analysis.

2.The Research Project

Company Background

In the fall of 2007, LogisticsCo, an $500 million aerospace logistics firm headquartered in the UK and with operations in five countries, embarked on a review of its IT operations. The company had experienced tremendous growth since 2004 both organically and through acquisitions. The IT strategy for acquisitions had been to keep local IT operations intact. In 2007, with high growth, more integration was desired so acquired organizations were to be moved to the company's ERP system as separate companies, preserving subsidiary item, customer, and vendor information. Several multi-day IT outages in 2007 led to the admission of problems within Central IT. The Core Team, comprised of the company president and directors, recognized that Central IT's operations presented a liability to be remedied (Author and Colleague, 2008). Within this framework, a team of six students and two professors undertook a 360^{o} review of the IT organization. The goal of the project was to develop recommendations that would help IT to reduce or eliminate outages.

LogisticsCo IT Organization

In the 1990s, LogisticsCo acquired an ERP system that was operated from Central IT in the UK. In 2007, the Central IT staff included six staff supporting the help desk, ERP support, and development; four staff operating the infrastructure; four staff developing a database to provide cross-references between item, vendor, and standardized item numbers; and one person had just begun working as the IT representative for new location provisioning. The ERP software had never been upgraded from its text-line-oriented green screen incarnation. Instead, the base software was overlaid with a highly customized text-line-oriented green screen front-end that supported LogisticsCo's unique needs. Over the years, arguments about added functionality, weak CIOs and CIOs who did not fit the position had led to a rift between IT and the rest of the organization. The business units, in defensive moves, developed their own IT organizations. The business unit organizations included infrastructure equipment, managers, and staff to support local needs (e.g., for desktop computing). Other business unit IT staff were charged with local user desktop support, requirements development, and liaison to Central IT. Infrastructure was managed by each organization and coordination was not smooth, ending frequently in finger-pointing, frayed tempers, and delayed, incomplete work (Author and Colleague, 2008). The U.S. subsidiary, acquired by its UK-based parent company in 2001, operated independently until 2007, when an attempt at IT integration was made. Once completed, the integration resulted in several months of chaos in the U.S. organization, causing the new subsidiary president to become more active in LogisticsCo's IT management. Ultimately, he became the acting CIO (Author and Colleague, 2008).

In 2007, in addition to problems caused by the ERP system integration, LogisticsCo suffered several multi-day outages, which translated into missed service level agreements with key customers. These outages were caused by Central IT, which IT demonstrated little appreciation for the financial implications of these outages; even though Central IT recognized that IT outages cost the company money, they did not know how much. Also, the Central IT organization was unaware of missed customer service agreements. This lack of understanding exacerbated the rift between Central IT and the business units (Author and Colleague, 2008)

3.Assessment Methodology

A level of effort assessment was conducted. A level of effort essentially uses time allotted (or time boxing) for gathering and analyzing information. Recommendations are necessarily based on incomplete information and imperfect knowledge. The key to successfully performing a time-constrained assessment is to ensure that sufficient information for decision-making is obtained. Therefore, the data gathering was considered sufficient when enough information had been obtained to meet the goal of mitigating outages. The professor managing the team had worked in a consulting environment that operated according to 'level of effort' for most assignments. The research team was divided into three sub-teams: infrastructure, applications, and operational processes. Each sub-team consisted of a professor and two graduate students. Students' concentrations were Information Assurance, IT Service Management, and Information Technology, thus covering all of the areas for the assessment. The team enjoyed a total of 120 years of working experience, combining the actual industry experience of the team and professors.

The team interviewed over 40 individuals in the two UK locations and the Texas location. Interviewees included three members of the five members of the Core Team, three managers/IT users in supply chain management, accounting, and marketing, all IT staff in the U.S., all IT staff in the Central IT group in the U.K., and several other individuals who either managed decentralized servers or were IT users.

4.Findings

The expectations going into the assessment were that poor processes, skills, and management practices would be the cause of Central IT's problems. Technology was seen as am major problem for the organization. Further, the expectation was that a clear direction to determine an 'ideal state' and to develop a gap analysis from to allow planning migration from the current to the ideal state would be feasible. The findings were more complex than this simply view. With respect to the expectations, the findings, in very summarized form, were that staff skill levels in both applications and operations were sufficient for their tasks, with several people clearly superior in their skills. However, these same people (one telecomm support and one applications manager) were also the "heroes" that caused some of the problems.

Staff in the business units were identified as generally under-skilled and non-communicative with the Central IT organization (Author and Colleague, 2008). As the interviews were completed, the results were assessed to summarize key issues identified by the individual. A list of issues was maintained throughout the interview cycle. In all, over 120 issues were identified. After removing items that were more complaints than issues and consolidating issues that related to the same concept, 72 discrete issues remained (A list of issues is available upon request).

Analysis The first pass analysis was to define the overall current state and Central IT's organizational maturity. Each area analyzed – IT governance, application development, and infrastructure operations – was assessed to determine the maturity level of the activities being performed. The Control Objectives for Information and related Technologies (CobiT) maturity model was used for the LogisticsCo assessment and to profile IT processes' current and desired

future states. The advantage of a maturity assessment approach is that it is relatively easy for an organization to assess IT processes on the scale defined and understand steps needed to improve maturity of operational performance. The 0-5 scale is shows how a process moves from a non-existent capability to an optimized capability. Processes mature incrementally over time thus, trying to move a process from 0 to 5 in one large project is not recommended. Smaller more focused improvement projects allow the organization to absorb the changes and employees to realize tangible results, creating support and ongoing motivation for the program. The descriptions of CobiT maturity levels are:

- Level 0 Non-existent—Lack of any recognizable processes.
- Level 1 Initial/Ad Hoc - The enterprise recognizes that issues exist and need to be addressed. There are no standardized processes. Instead, processes are ad hoc and applied on an individual basis. Overall, process management is disorganized.
- Level 2 Repeatable but Intuitive - Different people undertaking the same task follow similar processes but without formal training. Responsibility for following the process is left to the individual. Therefore, errors and lack of process are likely.
- Level 3 Defined Process - Procedures are standardized, documented, and communicated through training. Process adherence is mandatory but procedures are unsophisticated formalizations of current practices.
- Level 4 - Managed and measurable: Management monitors and measures compliance with procedures and takes action where processes appear not to be working effectively. This is a level of 'good practice.'
- Level 5 Optimized—Processes are refined to a level of best practice, based on the results of continuous improvement, automated measurement, and maturity benchmarking against other enterprises.

While some companies view level 5 as providing competitive advantage (e.g., outsourcers), many companies strive for level 4 – managed and measurable, that are documented with meaningful metrics, with staff trained in their application and everyone following the processes. It is this level at which the recommendations were targeted. Few processes existed and those that did – incident management, for instance, were ineffective in terms of satisfying customers in a timely manner. With virtually no processes being used to manage the work, the overall Central IT organization was deemed to be at Cobit Level 0. This posed problems for the analysis because the goal rapidly shifted from defining an ideal to which the gap analysis would apply to becoming one of defining a stable baseline to which the organization should first aspire. Technical suggestions relating to this aspect of the analysis were, for instance, to completely remove development testing from the production environment, develop and deploy source code management software, and develop and deploy change management discipline. However, these technical suggestions did not address the key issues, which appeared unrelated to technology issues. The second pass analysis was where the Ishikawa diagrams and 2x2 matrices were expected to be used. A first pass at creating an Ishikawa diagram resulted in frustration followed by laughter when the realization struck that trying to place 72 different issues in six categories that didn't really fit was not going to work. The exercise then turned to defining the categories that made the most sense for LogisticsCo's context and trying to determine the best method of

presenting that information A brainstorming session was conducted to define the minimal set of categories to define the issues. Ideally, this exercise would yield two categories that would allow 2x2 matrix analysis. However, issue diversity caused the definition of two major dimensions each with three categories of the problems. From a business perspective, issues related to strategic, tactical/managerial, and operational issues. From a problem perspective, issues related to people, process, and technology. The issues could have been addressed in a series of tables or diagrams that looked at one category from one perspective, yielding at least three analyses. For instance, one analysis would have been strategic issues relating to policy, process, and technology. But, after more discussion, some of the groupings of items were not that clearly one category. Therefore, the group developed a customized graphical matrix to depict the problems and provide a visual summary of the issues.

Custom Matrix

Each issue was arbitrarily assigned a number from 1 to 72 and it was explained to the client organization that the numbers in no way indicated severity or importance.

The custom matrix (Figure 3) maps the 72 issues by their number, assigning them to an organizational level and a problem category. Because of the nature of some of the issues, there is a fair amount of crossover between problem categories. The matrix shows that most of the problems were for the Core Team to resolve, lying in the strategic level and, mostly relating to human resource and process issues. Examples of these issues included the lack of a CIO for IT, a reporting structure that gave decentralized IT staff carte blanche on their activities with no accountability for quality or quantity of work, unclear responsibilities across organizations on responsibilities for IT-related activities.

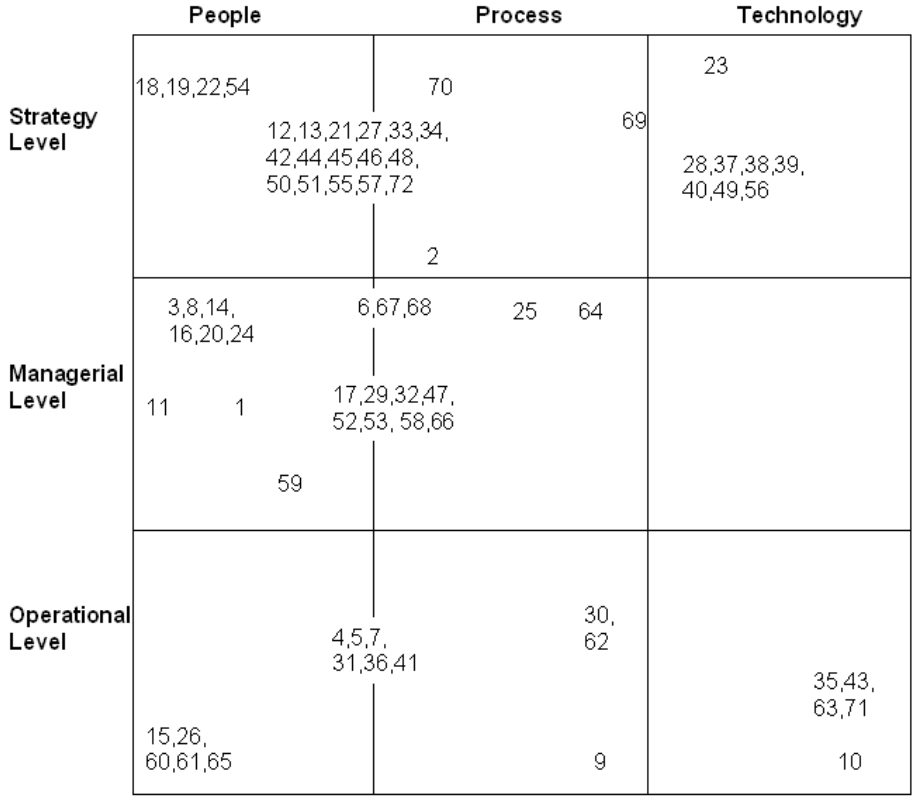

Figure 3. Issue Mapping on Organization and Problem Dimensions

5.Discussion

As a 'talking summary' of the issues, the table was useful in helping the LogisticsCo executives recognize the true nature of the Central IT problems differed from the general perception that there were serious technology issues. LogisticsCo's managers believed that the bulk of the problems rested with the IT infrastructure technology. With this assumption, the bulk of issues were expected to be in the right column at the operational level. Even with only a quick glance at the matrix, the strategic level of problems is apparent. Of the 72 issues, 32 (45%) were strategic, 21 (29%) were managerial, and 19 (26%) were operational. Many of the strategic issues related to a cultural rift between Central IT and the rest of the organization that was expressed in every interview in some way. This rift was evidenced in a lack of any regular communication between Central IT and the rest of the organization. Several managers stated that they went out of their way not to talk to Central IT. When presented to the Core Team, the discussion centered around how to turn the situation around most effectively without sacrificing responsiveness to growth needs. Hiring of a CIO was seen as a critical step in addressing the issues but, distrust of IT was such that the CIO would not be a member of the Core Team. Strategic technology issues related to a lack of standardization in remote site infrastructure and ERP setup and a lack of direction in terms of infrastructure growth. While the CIO was expected to be the primary person to address these issues, the Core Team immediately stated a desire to standardize to the extent feasible to simplify installations and maintenance, and to minimize maintenance costs. From the discussion and subsequent directives the Core Team issued, their willingness to deal with the strategic issues was apparent. The matrix served an important purpose in highlighting the issues that needed their resolution. Looking at the issues from the people, process and technology perspective, 59 (82%) of the issues involved people and processes. The people/process issues recognition also was important for the Core Team to gain the realization that as the company grew, the way of working that had made them successful in the company's initial growth, would not be successful in the next stage of company growth. As a result, the notion that some process standardization would be desirable and needed developed. Further, by separating testing and production, and introducing processes for change management, the minimizing of computing outages could be partially accomplished. The Core Team was surprised to learn that only 13 (18%) of the issues were related to technology. Of these items, none were at the managerial level and only 5 (7%) were at the operational level. Operational technology issues, when compared to the larger cultural issues, though minor were still important to resolving the outages. These issues included, for instance, dangerous wiring closet management, lack of accountability and responsibility for anti-virus updates, and lack planned updates for desktop maintenance. Identification of these issues was important to resolving the initial goal of minimizing computing outages. Each quadrant of the matrix sparked its own discussion of the issues as did the 'slices' of the matrix dealing with people, process, and technology and strategic, management, and operational level issues. For each, some discussion dealt with appropriate responsibility, immediacy of needs, and expected corporate impacts. As a catalyst for launching appropriate discussions on problem resolution, the matrix performed as desired.

6.Conclusion

Performing a 360^{o} audit of an IT organization can be a daunting task. Relationships of centralized IT departments often are in conflict with business units and decentralized IT staff and groups. Identifying the issues and mapping each issues on a matrix by organization level of responsibility and by people, process, and technology allows managers to examine issues separate from the situational politics. Further, by first, categorizing the problems, then systematically decomposing causes and defining solutions by quadrants and by 'slices' of the matrix, provides a 360^{o} discussion of the issues as well. While this is a single case study, the potential uses for this matrix in other situations should prove valuable to initiating a discussion of issues that works toward their productive resolution. In any case, the development of this simple matrix, when driven by the lack of adequate other methods for displaying and summarizing information, should encourage others performing complex analyses not to rely on existing tools when they really do not fit the situation. Instead, the issues should be analyzed to customize a matrix that provides appropriate categories for discussion.

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