

Moving Past Gantt and PERT Reinforcing Metrics as a Management Tool for CIS Students

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Abstract

Courses in Computer Information Systems programs need to stay current with technological change and its resulting progress. Computer Information Systems students not only need to keep their computer knowledge up to date, but also understand how the application of this knowledge is used within their work organizations. Courses in supporting disciplines must also ensure that Computer Information Systems students stay current in those fields. Project management metrics from an Information Technology perspective are covered in a number of Computer Information Systems courses. The inclusion of a discussion of metrics in a Principles of Management course would reinforce the use of metrics from a manager's perspective.

Keywords: metrics, management, measurement, computer information systems, principles of management course, information technology curriculum

1. INTRODUCTION

As Computer Information Systems (CIS) departments know, the need for CIS programs to continue to evolve and adapt as the technology progresses is great. Moving from one curriculum guideline to another (i.e. IS 1997 to IS 2002), in addition to new paradigm shifts in theory, force departments to invoke "process feedback loop" introspection of courses and support systems. In addition to the technological changes and challenges to a department, there is a realization that other disciplines, which support the CIS students also, need to change to stay relevant. In our opinion, no other department is more supportive of the goals and outcomes of CIS than Business Administration. Revising the Principles of Management course is the specific focus of this paper. The revision will consist of a discussion of the need for, the creation of, and the incorporation of a

metrics supplement emphasizing e-commerce and e-management into the Principles of Management course.

At The University of Maine at Augusta, students in the CIS degree programs are required to take a Principles of Management course. The course is provided through the Business Administration department, and is the same course as is offered to all business administration majors, public administration majors, and criminal justice majors. The management course is required of the CIS students to prepare them as graduates to not only be able to step into a job requiring their computer knowledge but also be prepared to assume positions of management within a department or organization. The job environment CIS graduates face in the State of Maine is such that it is conceivable (and even probable) that a Bachelor's degree will open doors to positions in man-

agement; therefore, CIS graduates should have a solid understanding of management theories and techniques.

More than ever, managers need to be IT savvy to succeed. Planning, organizing and evaluating projects require measuring and analyzing feedback data at critical phases of the process. It has been reported that nearly one-third of new IS projects are canceled before completion – at a combined cost of \$81 billion. And, more than half of all projects completed are significantly over budget (Ewusi-Mensah 1997). The Standish Group reported that, in the early 1990s, U.S. companies spent more than \$250 billion each year on IS projects, with a success rate of only 16.2% as rated by IS executives. By 2000, the success rate, though improved, was still only 28% (Xia & Lee 2004). Lack of a management measurement system and lack of managerial involvement are the prime factors contributing to this enormous waste of time and money. Though researchers have noted that Computer Information Officers (CIOs) are not as technology phobic as in years past and are now beginning to understand how using technology supports business (Surmacz 2004), management in general may not yet be technical enough to understand IS projects, nor understand and properly use metrics as measurement tools for those projects.

Both Business Administration and CIS students need to learn the vocabulary and acquire an in-depth understanding of the use of IT in managerial control. CIS students take two management theory courses with the business majors: a Principles of Management course and a Management Information Systems course designed to improve understanding between managers and information systems specialists when confronting an organizational problem that requires planning and implementation of a complete business solution. The CIS students take other computer courses that cover project management, including Project Management and Systems Analysis and Design, but there appears to be a need to have those project management theories reinforced from a managerial perspective. According to Kock, any of the recent management schools of thought are compatible with using new Web-based IT systems (Kock 2002). The question becomes how managers can be taught utilization of IT to implement

an effective measurement system and how they can become more effective managers themselves.

To determine how well the Principles of Management course serves the CIS students, a review of the text used at UMA and other popular Principles of Management texts was undertaken to see what coverage is given to measurement techniques. The review revealed that current Principles of Management texts (to include those with copyrights of 2003, 2004, and 2005) seem to ignore emerging trends for management to utilize IT to better manage digital data/information. Though each text included a definition of the terms “e-business” and “e-commerce” and included Gantt charts and PERT diagrams as process control tools, NONE of the texts even mentioned the word “metrics.” The six texts reviewed all cover in theory the functions of management in depth: plan, organize, direct and control with a focus on completing projects on time and within budget. There was not a demonstration of HOW to plan a project, organize resources, direct people in completing the assigned tasks, and evaluate if the project is meeting all objectives, or how those objectives are measured.

2. THE NEED FOR METRICS

Metrics help a manager measure progress of projects. Management identifies a need in the organization, evaluates alternative courses of action, determines the desired results/goals of the preferred course of action, and then designs benchmarks to measure progress. These benchmarks provide managers with the information needed to determine if a project is on track or if corrective action needs to be taken. As Symantec CEO John Thompson said: “You can’t manage what you don’t measure” (Liss 2003). From DeMarco’s *Controlling Software Projects*, “You can’t control what you can’t measure.” (Anselmo & Ledgard 2003). Managers can’t measure if they haven’t designed an objective way to evaluate data and compare to established benchmarks. Measurement helps managers objectively evaluate risks and problems early on. It allows managers to assess organizational performance; it supports managerial decision-making; it enables managers to improve processes and quality; and it helps to justify continued investment in the business

project (Goldenson, Jarzombek, & Rout 2003). The Department of Defense takes this issue very seriously via the Capability Maturity Model and requires that all major projects have a measurement process plan. (Phillips 2004)

Metrics are a source of information for management to track progress of a project. Metrics are designed to evaluate the status of the business, such as costs, profitability, inventory, sales, market share, customer satisfaction, schedule, performance targets, and others (Liss 2003). Metrics provide objective data which managers can use to identify problems and evaluate alternative courses of action. But, how does a manager utilize IT to identify those areas that are critical to a project and measure their success? Management must first determine the desired results of a project and then design metrics to measure progress. The data gathered should be easy to assemble and easy to understand. More complex metrics and more complex systems may be more costly in time and money to the organization and be counter productive to the organization's bottom line.

3. THE NEED FOR METRICS IN A MANAGEMENT COURSE

Though the topic of metrics is covered in upper level CIS courses and business courses, we propose a more focused discussion of the design and implementation of metrics be included as well in a Principles of Management course. To teach the management function of control by using only a discussion of Gantt charts and PERT charts leaves students with the ability to measure time used in a project, but not results. Managers can use metrics to not only keep track of revenue growth and expenses, but also customer satisfaction, market share, and earnings (Liss 2003). Companies have even used metrics to track effectiveness of training and job performance (Devaraj & Babu 2004). And, as many computer crimes happen from within rather than from outside an organization, sound management and proper metrics are one of the most overlooked and perhaps basic security procedures for any company. In fact, the best security may be in managing employees more effectively rather than relying on the latest technology (Forester and Morrison 1994).

Our goal is to create a metrics supplement which would lead towards an IT focused Principles of Management course to address issues posed in a changing business environment, e.g. e-commerce and e-management. This supplement would assist students in learning what questions to ask about what should be measured, what milestones should be accomplished, when should the milestones be accomplished, when to take corrective action if needed, and how to take advantage of the organization's IT infrastructure.

4. METRICS SUPPLEMENT

Managers, regardless of their level in the organization or their field of management, need metrics. If a person is in charge of organizational resources (budget, people, assets), then metrics are essential. Measuring use of resources is so important that it almost goes without saying; however, it is often almost overlooked in a fundamental management theory course.

The metrics supplement would be an ancillary to the Principles of Management texts used in a typical course. The supplement would use management scenarios to demonstrate the use of metrics. The following is a proposed outline of the supplement:

1. The Use and Evaluation of Metrics
 - Product development
 - Investment management
 - Quality improvement
 - Visualization
2. Purpose/Benefits of Measurement
 - Support for goals of management
 - Objective
 - Information source
 - Improved resource utilization
 - Reflection of what is, not what should be
 - Snapshot of current project indicators (Rosen 2003)
 - Corporate Security
3. What to Measure (would vary based on manager's department, i.e. Human Resources, Customer Service)
 - Revenue growth
 - Expenses
 - Customer satisfaction
 - Market share
 - Earnings
 - Job performance
 - Training effectiveness

4. Developing the Metrics Questions (Goldenson, Jarzombek, and Rout 2003)
 - Is there a problem?
 - What is the scope of the problem?
 - Can I trust the data?
 - What are my alternatives?
 - When can I expect to see results? (using PERT and Gantt in metrics)
 - What can I expect to see as results?
5. Pitfalls in Measurements (Rosen 2003)
 - Easy to capture and understand
 - Not cumbersome nor time-consuming
 - Costly
 - Scaled to fit project

5. IMPLEMENTATION PLAN

Every Principles of Management text has scenarios that students must analyze during the course. The expansion of that analysis would include what data could be collected, using metrics as an objective management tool, and the associated issues with metrics collection. A metrics focus could be added to chapters as shown below in a current syllabus reflecting a 15-week course covering topics to include planning, organizing, directing, and controlling. Managers must continue to be reminded that IT can be used to plan appropriately, to organize resources effectively, to motivate employees, and to evaluate the progress of a project/activity in an e-commerce environment.

As shown below, metrics will be discussed throughout the Principles of Management course where specifically applicable.

Principles of Management Syllabus:

WEEK TOPIC

- SUPPLEMENT

Week 1 Managers and Management

- Introduction to Metrics

Week 2 Managing in Today's World

- Current IT issues

Week 3 Foundations of Planning

- Metrics to set budget, resource allocation

Week 4 Decision Making

- Use of metrics to support decisions

Week 5 Test 1

Week 6 Organizational Design

- Evaluating organizational effectiveness using metrics

Week 7 Human Resource Management

- Metrics to evaluate performance, training

Week 8 Managing Change and Innovation

- Changing technology and its uses

Week 9 Work Teams

Week 10 Test 2

Week 11 Motivating and Rewarding

- Rewarding based on performance
- Employees' use of metrics to measure

Week 12 Leadership & Trust

Week 13 Communication/Interpersonal Skills

Week 14 Foundations of Control Technology and Control

- Metrics use in evaluating progress
- Other uses of IT for managerial control

Week 15 Final Exam

For example, in week 3, the following would be used as an example of metrics use in planning to help managers begin thinking IT, and include cost estimations, how to acquire resources, etc.

"The marketing department in the medical supply company where you work has just persuaded management to launch the introduction of a new product line. This new product line is predicted to improve the time frame for surgical patients to recuperate."

General questions usually follow such a scenario in a typical Principles of Management text. Examples of typical questions are:

1. What are long range goals for this launch?
2. What are short range goals for this launch?
3. What results do you think this company is expecting?

To get managers thinking about using metrics in planning, organizing, directing, and controlling, we would add these questions with examples of metrics-related follow-on questions (in italics):

1. What results are important to this company's success?
 - *What would you expect to see as results?*

- *How would metrics benefit the manager?*
 - *What is the cost of these metrics?*
2. How would you measure the results?
 - *What is needed to have your system obtain the metrics needed to measure the results?*
 - *What would the metrics tell you?*
 3. Define a series of milestones that need to be accomplished to achieve success.
 - *What would be the goal of time saving?*
 - *When would you know if something is wrong?*
 4. How would you keep track of the time frame?
 5. When can you expect to see results?
 - *How will you see results?*
 6. What resources would be used in the launch?
 7. How would you measure their use?
 - *Is the IT staff ready to collect the data needed to measure resource use?*
 - *How would metrics benefit you?*
 8. How can this product launch be refined for future use?
 - *How much variation could you have in your data/results?*
 - *What is needed to have your system obtain these metrics automatically (i.e. digitally?)*
 9. How could you save time and/or resources?
 - *How would metrics benefit you?*

This same scenario could continue to be used to demonstrate the value of using metrics in decision making (week 4), organizational design (week 6), human resource management (week 7), managing change and innovation (week 8), motivating and rewarding employees (week 11), leadership and trust(week 12), and foundations of control and technology and control (week 14). The metrics supplement will be on our website (<http://cisx1.uma.maine.edu/~jszakas/metrics/bua223.html>) and will be supported throughout implementation.

For assessment purposes, we plan to conduct a survey at the beginning of the Principles of Management course to assess students' awareness of metrics and their use as a management tool. After fully implementing the metrics supplement in the course, we

will conduct a survey at the conclusion of the course to determine if students' awareness of the use of metrics improved.

6. CONCLUSION

Change in management occurs at almost the same speed as change in the computer field. Change in supporting courses for students in the CIS program is almost as important as the change in the discipline from within. The need for understanding and using management metrics systems is here. This reality is demonstrated by the Department of Defense's requirement that any organization which bids for its contracts must be able to document its measurement process to be considered for a contract. Project metrics give organizations a competitive edge. It is time to address e-commerce and bring an IT focus into the Principles of Management course to support CIS students.

7. REFERENCES

- Anselmo, Donald and Henry Ledgard, 2003, "Measuring Productivity in the Software Industry." *Communications of the ACM*, November 2003, pp.121-125.
- Devaraj, Sarv and S. Ramesh Babu, 2004, "How to Measure the Relationship between Training and Job Performance." *Communications of the ACM*, May 2004, pp. 63-67.
- Ewusi-Mensah, Kweku, 1997, "Critical Issues in Abandoned Information Systems Development Projects." *Communications of the ACM*, September 1997, pp. 74-80.
- Forester, Tom and Perry Morrison, 1994, *Computer Ethics*. The MIT Press, Cambridge, MA.
- Goldenson, Dennis R., Joe Jarzombek and Terry Rout, 2003, "Measurement and Analysis in Capability Maturity Model Integration Models and Software Process Improvement 1," *FSC CrossTalk*.
- Kock, Ned, 2002, "Managing with a Web-Based IT in Mind." *Communications of the ACM*, May 2002, pp. 102-106.
- Liss, David, 2003, "Management by the Numbers." *Business Week Online*. July 21, 2003

- Phillips, Mike, 2004, "CMMI V1.1 and Appraisal Tutorial." Carnegie Mellon University, February 16, 2004.
- Rosen, Richard, 2003, "Using Project Management Metrics." www.device-link.com
- Surmacz, Jon, 2004, "Metrics: Retail Race." www.CIO.com, January 21, 2004.
- Xia, Weidong & Gwanhoo Lee, 2004, "Grasping the Complexity of IS Development Projects." *Communications of the ACM*, May 2004, pp. 69-74