Spring 2-1-2004

BADM 341.01: Systems and Operations

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BADM 341
SYSTEMS & OPERATIONS
COURSE OUTLINE--SPRING 2004 (Tentative)

Course Objectives and Approach
BADM 341 is a survey course, which bridges the gap between the design and the utilization of information systems. Information systems connect the enterprise (private or public, profit or nonprofit) to its contemporary environment, and generate essential information for use within and among its functional areas. The course stresses the following points:

1. The absolute necessity for computers and information systems in today's world
2. The design of information systems to meet the tactical and strategic needs of the enterprise
3. The implementation and use of information systems within the enterprise's operations function

The global economy is changing at an alarming rate. For example, nearly every day, the efficiency of production tools increases, computer power soars, new sources of energy emerge, and unexpected demographic pressures evolve. Change is everywhere. The enterprise's informed managers must keep up with all these changes and devise appropriate strategies to take advantage of them. Thus, the need for information and information systems is vital. This is especially true in the operations function. Operations is the core of the organization because it produces the goods or services that ultimately generate revenue.

To beat the competition, Operations must constantly strive to make the enterprise's products faster, cheaper, and better. The objective is to exceed customers' expectations. To accomplish this, Operations implements and uses very sophisticated information systems, which process vast amounts of data and distribute the resulting information throughout the organization. Operations managers use daily, repetitive information to analyze costs, schedule production, control inventory, enhance quality, improve productivity, and prepare status reports. They use long-range, predictive information, i.e., demand forecasts, to assess the customers' changing expectations, exceed competitors' potential to satisfy those expectations, and execute the business strategy. Frequently, the business strategy calls for capacity expansion, new product introductions, and/or reengineering processes. Without formal information systems, the magnitude and complexity of the operations managers' responsibilities would overwhelm them.

Required Material
Grading
Letter grades for the course will be based on performance on the following instruments:

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>30%</td>
</tr>
<tr>
<td>Test 2</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Homework
Prior to coming to class, each student is expected to have solved the "Discussion Problems" listed in the syllabus. The problems will serve as a direct basis for the tests. That is, there is a high probability that a subset of the problems will appear in a slightly altered form on the tests. Thus, a student who has conscientiously prepared each problem will have also prepared well for the tests. The homework will not be collected nor graded. Six sets of solutions to the problems are reserved in the Mansfield Library.

Tests
The tests will be conducted during the class periods indicated and will be approximately 80 minutes in length. Each test will cover the material presented in class and assigned as homework. It will contain short essay/problem type questions. It may also contain true/false and/or multiple choice questions.

Final
The exam will consist of short essay/problem type questions covering the material discussed in class and assigned in the textbook. It may also contain true/false and/or multiple choice questions.

Rescheduling a Test
A student desiring to reschedule a test must present the instructor with a satisfactory reason at least one week prior to the exam date. The tests must be made up within one week after their scheduled dates.
Problem Assignment for Chapter 4

1. An entrepreneur is starting a new business. The activities and times required are given below:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Immediate Predecessors</th>
<th>a</th>
<th>m</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>b</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c</td>
<td>a</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d</td>
<td>a</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>e</td>
<td>b,c</td>
<td>2</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>f</td>
<td>b,c</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g</td>
<td>d,e</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

a. Draw an AOA network diagram.
b. Calculate the expected time and variance for each activity.
c. Calculate the expected time and variance for the entire project.
d. What is the probability the project can be completed in 14 days?

2. A plant startup is based on the following CPM network:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Immediate Predecessors</th>
<th>Normal Time (Days)</th>
<th>Normal Cost ($)</th>
<th>Crash Time (Days)</th>
<th>Crash Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
<td>4</td>
<td>100</td>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td>8</td>
<td>80</td>
<td>2</td>
<td>140</td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>2</td>
<td>40</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>d</td>
<td>a</td>
<td>3</td>
<td>80</td>
<td>2</td>
<td>120</td>
</tr>
<tr>
<td>e</td>
<td>a</td>
<td>5</td>
<td>80</td>
<td>3</td>
<td>140</td>
</tr>
<tr>
<td>f</td>
<td>c</td>
<td>5</td>
<td>60</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>g</td>
<td>b,d</td>
<td>6</td>
<td>120</td>
<td>2</td>
<td>160</td>
</tr>
</tbody>
</table>

a. Draw an AOA network diagram.
b. What is the ES, LS, EF, LF, and slack for each activity (use normal time)?
c. What is the normal project completion time and normal cost?
d. Identify the critical path.
e. How much will it cost to crash the project by 1 day? By 2 days?

Problem Assignment for Chapter 12

3. The K&R Camera Shop sells all the latest cameras and accessories. To meet customer demand, the manager must forecast demand for the items she sells. Lately the XR-42S zoom lens has been very popular. Recent monthly demand for this item has been as shown:

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Lenses Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>23</td>
</tr>
</tbody>
</table>

a. Forecast XR-42S demand for months 4-6, using a weighted moving average. The weights are 0.5, 0.3, and 0.2, where 0.5 refers to the most recent demand.
b. Repeat part a, using exponential smoothing with α=0.2. Assume that the average at the end of month 2 was 15 lenses.
c. What is the forecast for week 7, using each method?
d. For each of the forecasts in parts a and b above, calculate the cumulative sum of the forecast error (CFE) and mean absolute deviation (MAD). Based on CFE and MAD, which of the two forecasting techniques is doing the best job?
Problem Assignment for Assembly Line Balancing

4. An assembly line must produce 40 microwave ovens per hour. The following data give the necessary information:

<table>
<thead>
<tr>
<th>Task</th>
<th>Time (Sec)</th>
<th>Preceding Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>None</td>
</tr>
<tr>
<td>B</td>
<td>55</td>
<td>A</td>
</tr>
<tr>
<td>C</td>
<td>25</td>
<td>B</td>
</tr>
<tr>
<td>D</td>
<td>40</td>
<td>B</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>B</td>
</tr>
<tr>
<td>F</td>
<td>35</td>
<td>A</td>
</tr>
<tr>
<td>G</td>
<td>14</td>
<td>D,E</td>
</tr>
<tr>
<td>H</td>
<td>40</td>
<td>C,F,G</td>
</tr>
</tbody>
</table>

a. Draw a precedence diagram (AON).
b. What cycle time (in seconds) ensures the desired output rate?
c. What is the theoretical minimum number of stations?
d. What is the theoretical maximum efficiency?
e. Balance the assembly line.
<table>
<thead>
<tr>
<th>Week</th>
<th>Discussion Topic</th>
<th>Reading Assignment</th>
<th>Discussion Questions and Problems</th>
</tr>
</thead>
</table>
| 1    | Introduction: Information Systems  
Introduction: Operations Management                                               | Ch 1 (J/V)  
Ch 1 (K/R) | Q1-9 & P1  
Q3 & P2 |
| 2    | Project Management: Constant Time Network                                         | Ch 4 (K/R)        | Q1 & Q2 |
| 3    | Project Management: Project Evaluation and Review Technique  
Project Management: Critical Path Method                                        | Ch 4 (K/R)  
Ch 4 (K/R) | P1 (Attached)  
P2 (Attached) |
| 4    | Database Management  
Telecommunications and the Internet                                                   | Ch 3 (J/V)  
Ch 4 (J/V) | Q1-10 & P1  
Q1-10 & P1 |
| 5    | Electronic Commerce, Intranets, and Extranets  
Organizational Systems  
Enterprise-Wide Information Systems  
TEST NUMBER 1 (Friday, 27 Feb.)                                                 | Ch 5 (J/V)  
Ch 6 (J/V)  
Ch 7 (J/V)  
Weeks 1-5 | Q1-10 & P1  
Q1-15 & P1  
Q1-10 & P1 |
| 6    | Forecasting: Moving Average  
Forecasting: Exponential Smoothing                                                  | Ch 12 (K/R)  
Ch 12 (K/R) | P1  
P3 (Attached) |
| 7    | Forecasting: Forecast Errors  
Process and Layout Strategy: Theory                                                  | Ch 12 (K/R)  
Ch 3 (K/R) | P8 |
| 8    | Assembly Line Balancing  
Inventory Management: EOQ and Q-System                                               | Lecture Material  
Ch 13 (K/R) | P4 (Attached)  
P6 & P12 |
| 9    | Inventory Management: P-System  
TEST NUMBER 2 (Friday, 26 March)                                                    | Ch 13 (K/R)  
Weeks 6-9 | P17 |
| 10   | Aggregate Planning  
Master Production Scheduling and Material Requirements Planning: Techniques     | Su G (K/R)  
Su G (K/R) | P3, P4 & P7 |
| 11   | Master Production Scheduling and Material Requirements Planning  
Lean Systems: Just-In-Time                                                           | Ch 15 (K/R)  
Ch 16 (K/R) | P1, P7, P12 & P13  
Q1 & Q2 |
| 12   | Total Quality Management  
The Deming of America                                                                           | Ch 6 (K/R)  
Video | Q1, Q2 & Q3 |
| 13   | Quality Control: Acceptance Sampling  
Quality Control: Statistical Process Control                                            | Lecture Material  
Ch 7 (K/R) | P4 & P7 |
| 14   | Working in America: Hazardous Duty  
Review for Final Exam                                                                   | Video  
Lecture Material | |
| 15   | FINAL EXAM                                                                        | Weeks 10-15 | |