

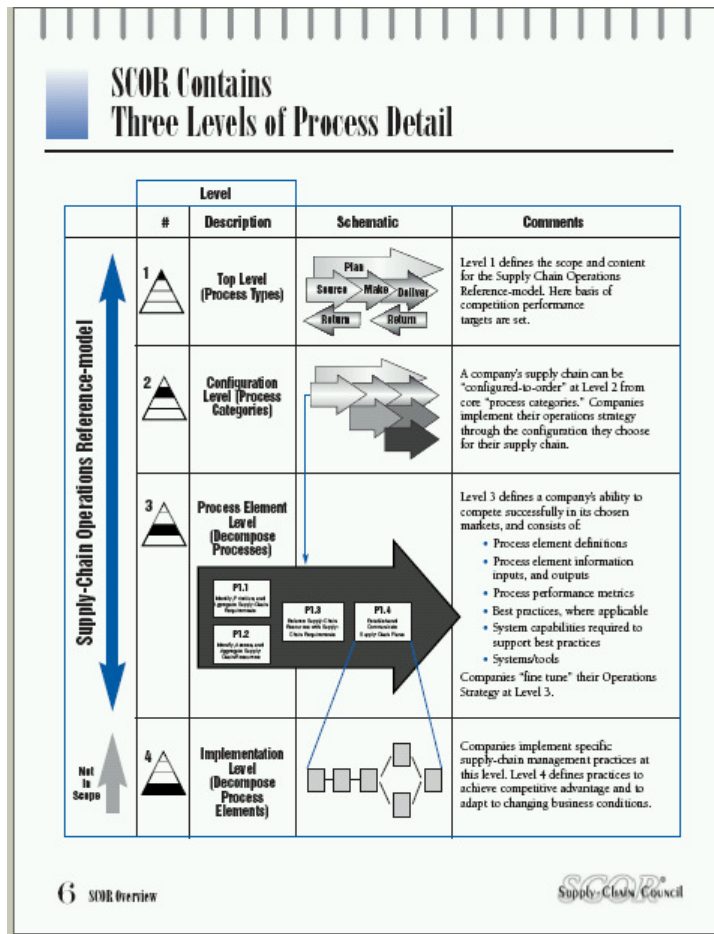
## Notes on TMGT 8510 System Design and Control

“This course examines the consequences of global markets, meaning that successful competition in an uneven cultural, economic, political, and social playing field requires deriving cost efficiencies from constantly re-engineered, extended supply chains. The best of the re-engineering takes a total cost analysis approach, viewing all parts of the supply chain as an integrated whole and leaving nothing in isolation. Students are introduced to the design and control techniques that derive from a systems approach.”<sup>1</sup>

### Discussion

This course decomposes into three parts.

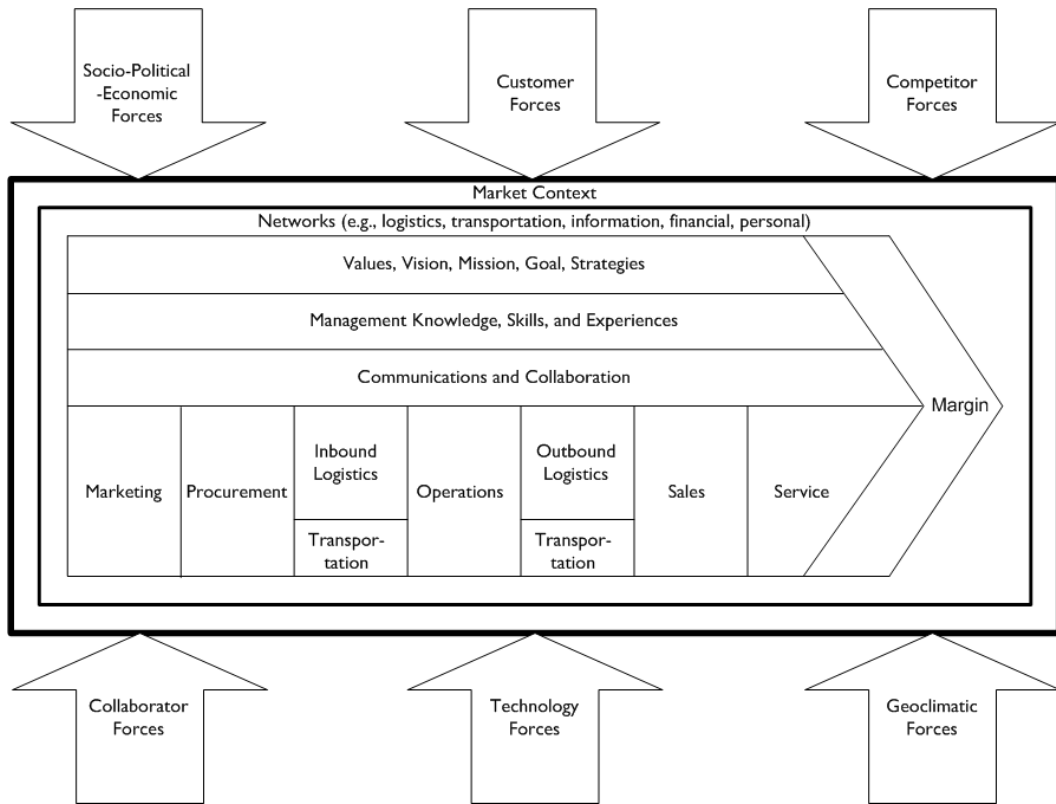
1. The nature of systems. This nature needs to be illustrated through example. The Supply Chain Operations Reference model<sup>2</sup> might very well serve this purpose.



<sup>1</sup> Larry Howard, Catalog Description Form, "TMGT 7060 System Design and Control," February 14, 2007. The course number was subsequently changes to 8510.

<sup>2</sup> Supply-Chain Council, <http://www.supply-chain.org/cs/root/home> [January 7, 2008]

- a. The Characteristics of Systems
  - b. Types of Systems
    - i. Physical
    - ii. Information
    - iii. Human
  - c. Supply Chain Operations Reference Model
    - i. What's in
    - ii. What's out
2. The criteria that influence the design of systems.<sup>3</sup>

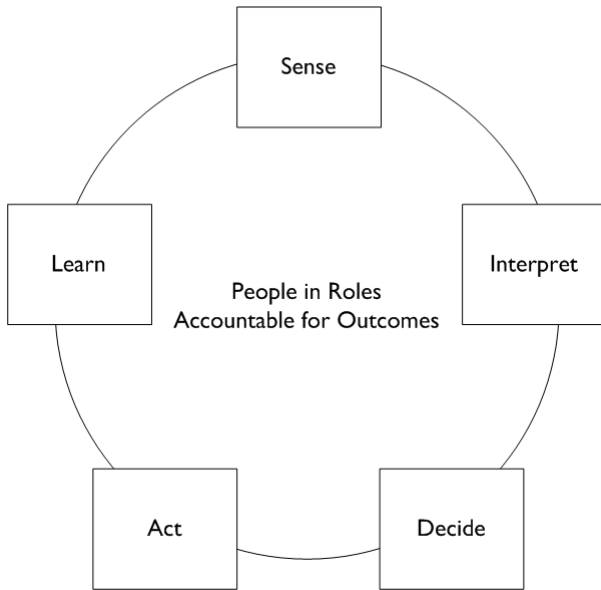


- a. Business drivers
- b. Business configuration
- c. Resource availability

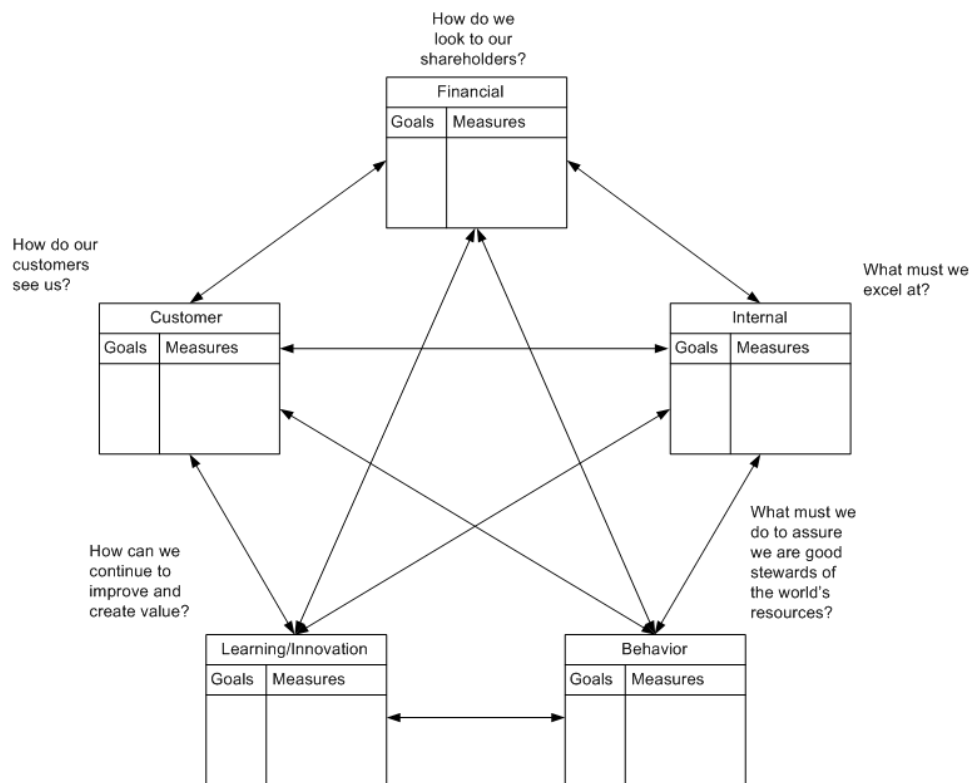
3. The manner in which control is exerted over systems. This implies examination of the capability and capacity to sense, interpret, decide, act, and learn.<sup>4</sup>

<sup>3</sup> The core of this diagram is adapted from Michel E. Porter, Competitive Advantage: Creating and Sustaining Superior Performance (The Free Press, 1985) 0-02-925090-0

<sup>4</sup> Adapted from Stephan H. Haeckel and Adrian J. Slywotzky, Adaptive Enterprise: Creating and Leading Sense-and-Respond Organizations (Harvard Business School Press, 1999) 0-875-84874-5

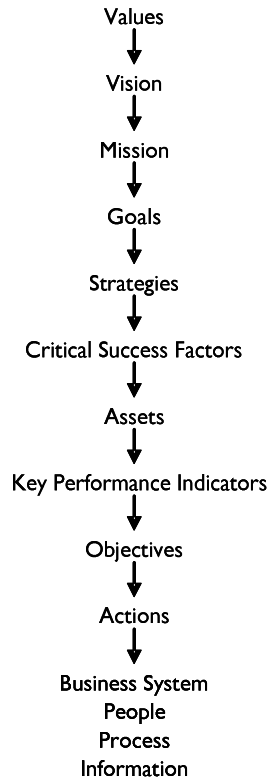


The sensing needs to be within an appropriate measurement context.<sup>5</sup>



#### 4. The Business Configuration as a Framework

<sup>5</sup> Adapted from Robert S. Kaplan and David P. Norton, "The Balanced Scorecard - Measures That Drive Performance," Harvard Business Review, January-February 1992 (1992)



I have, for some time, used the business configuration as a framework for examining a number of issues associated with understanding businesses (and other organizations) and how they can be made to work better. That is, it has been used as a diagnostic.

It seems as if it has possibilities as an integrating framework whereby we can examine system design and control at the business level. For example;

- a. Where and how do elements of system design and control affect the structure?
- b. How do elements of system design and control vary across the structure?
- c. What sets of knowledge, skills, and experience are required to carry out system design and control at various levels of the business configuration?

These, then, are the basic tenets upon which the course ought to be structured.

If the foregoing argument is accepted, then the text recommended for this course, John H. Nugent, *Plan to Win: Analytical and Operational Tools: Gaining Competitive Advantage* (2 edition March 31, 2003), McGraw-Hill Primis Custom Publishing, ISBN-13: 978-0072931617, seems inadequate. It is almost exclusively aligned with measurement of financial performance and says little about system design and control.

Senge's "The Fifth Discipline Fieldbook"<sup>6</sup> is considered more appropriate, but, on its own, not sufficiently comprehensive. Portions of Stock and Lambert's "Strategic Logistics Management"<sup>7</sup> are appropriate. Other appropriate texts include (Pine), (Weick and Sutcliffe), and (Gabel and Pilnick). There are likely other appropriate materials. For example, material dealing with the design of what's currently called social networking and/or knowledge management systems.

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<sup>6</sup> Peter M. Senge, Richard Ross, Bryan Smith, Charlotte Roberts and Art Kleiner, *The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization* (New York: Doubleday, 1994) 0-385-47256-0

<sup>7</sup> James R. Stock and Douglas M. Lambert, *Strategic Logistics Management*, Fourth ed. (McGraw-Hill, 2001) 0-256-13687-4

A rather comprehensive reading list may result that could prove a burden for the students in terms of their ability to internalize the material (to say nothing of cost). This suggests that an early pedagogic decision needs to be made as to the major topical areas to be covered. The course description is both broad and narrow. Some compromise is needed here.

## Course Schedule

Topics and Assignments	Due Dates
1. Introduction to the Course and to System Design and Control 1.1. In-class 1.1.1. What do you know of systems design and control? 1.1.1.1. Rudyard Kipling's Six Best Friends 1.1.2. Introduction to the Course and to System Design and Control (presentation) 1.1.3. <a href="#">Microsoft PowerPoint - Sgouridis System Dynamics I01</a> <sup>8</sup> 1.1.4. Dynamics in Systems (a presentation that drives home the need to understand the dynamics of systems) 1.1.4.1. Galloping Gertie <sup>9</sup> 1.1.4.2. Why Webvan Drove Off a Cliff <sup>10</sup> 1.1.4.3. Enron <sup>11</sup> 1.1.5. An Introduction to SLN	8-26-8
<b>No class. Hold Monday classes on Tuesday. Labor Day.</b>	<b>9-2-8</b>
2. Learning in and about Complex Systems 2.1. Reading Assignment 2.1.1. Sterman Chapter 1: Learning in and about Complex Systems 2.1.2. Drogan: <a href="#">An Introduction to System Design and Control</a> 2.1.3. Heuer; pp iii, v-vii, ix-xi, xiii-xv <sup>12</sup> 2.1.4. Forrester, System Dynamics and the Lessons of 35 Years <sup>13</sup> 2.2. Writing Assignment 2.2.1. Using causal loops, describe the system whereby you learn.	9-9-8
3. System Dynamics in Action	9-16-8

<sup>8</sup> MITOPENCOURSEWARE, Massachusetts Institute of Technology, <http://ocw.mit.edu/OcwWeb/web/home/home/index.htm> [May 26, 2008]

<sup>9</sup> YouTube, Tacoma Narrows Newsreel, <http://www.youtube.com/watch?v=HxTZ446tbzE> [June 17, 2008]

<sup>10</sup> Joanna Glasner, "Why Webvan Drove Off a Cliff," Wired, July 10, 2001, <http://www.wired.com/techbiz/media/news/2001/07/45098> [June 17, 2008]

<sup>11</sup> Washington Post, "Post Series: The Fall of Enron," <http://www.washingtonpost.com/wp-dyn/business/specials/energy/enron/> [June 17, 2008]

<sup>12</sup> Jr Richards J. Heuer, *Psychology of Intelligence Analysis* (Central Intelligence Agency, 1999)

<sup>13</sup> Jay W. Forrester, *System Dynamics and the Lessons of 35 Years*, 1991, Sloan School of Management, Massachusetts Institute of Technology, <http://sysdyn.clexchange.org/sdep/papers/D-4224-4.pdf>, [June 4, 2008]

<p>3.1. Reading Assignment</p> <p>3.1.1. Sterman Chapter 2: System Dynamics in Action</p> <p>3.2. In-class</p> <p>3.2.1. Review of how we learn</p> <p>3.2.2. The Beer Game<sup>14</sup></p> <p>3.3. Discussion Assignment</p> <p>3.3.1. What are the characteristics of systems most amenable to systems thinking?</p>	
<p>4. The Modeling Process</p> <p>4.1. Reading Assignment</p> <p>4.1.1. Sterman Chapter 3: The Modeling Process</p> <p>4.1.2. Lecture Note: Cultural Acumen for the Global Manager: Lessons from Project Globe<sup>15</sup></p> <p>4.2. In-class</p> <p>4.2.1. Relooking at the learning system on the basis of chapter 3 of Sterman</p> <p>4.3. Discussion Assignment</p> <p>4.3.1. How do the factors identified by House and Javidan affect the approach to modeling?</p>	9-23-8
<p>5. Structure and Behavior of Dynamic Systems</p> <p>5.1. Reading Assignment</p> <p>5.1.1. Sterman Chapter 4: Structure and Behavior of Dynamic Systems</p> <p>5.1.2. Lecture Note: <a href="#">An Introduction to the Supply Chain</a></p> <p>5.2. In-class</p> <p>5.2.1. Detailed review of Sterman Chapter 4 (some extra work is required to absorb what Sterman has to say)</p> <p>5.3. Discussion Assignment</p> <p>5.3.1. What are the dynamics in a supply chain? What structures contribute to these dynamics?</p>	9-30-8
<p>6. Causal Loop Diagrams</p> <p>6.1. Reading Assignment</p> <p>6.1.1. Sterman Chapter 5: Causal Loop Diagrams, pp 135-174</p> <p>6.2. In-class</p> <p>6.2.1. Detailed review of Sterman Chapter 5 (some extra work is required to absorb what Sterman has to say)</p>	10-7-8

<sup>14</sup> David Simchi-Levi; Philip Kaminsky; Edith Simchi-Levi, *Designing and Managing the Supply Chain W/ Student Cd-Rom (2nd Edition)* (McGraw-Hill/Irwin, 2002) 0-072-84553-8 of MA Systems, <http://www.masystem.com/beergame> [June 17, 2008]

<sup>15</sup> Mansour Javidan and Robert J. House, "Cultural Acumen for the Global Manager: Lessons from Project Globe," *Organizational Dynamics*, 29 4 (2001)

<p>6.3. Discussion Assignment</p> <p>6.3.1. The Oil Crisis of the 1970s, Sterman p 172-173</p> <p>6.4. Other</p> <p>6.4.1. Causal Loop Cribsheet</p>	
<p>7. Stocks and Flows</p> <p>7.1. Reading Assignment</p> <p>7.1.1. Sterman Chapter 6 : Stocks and Flows</p> <p>7.2. In-class</p> <p>7.2.1. What's first? Stocks and flows, or behavior (causal loops)?</p> <p>7.3. Discussion Assignment</p> <p>7.3.1. First model of a supply chain (do not use Bolstorff and Rosenbaum as a basis)</p>	<p>10-15-8</p> <p>Note that this is a Wednesday. Columbus Day is 10-13-8</p>
<p>8. Dynamics of Stocks and Flows</p> <p>8.1. Reading Assignment</p> <p>8.1.1. Sterman Chapter 7: Dynamics of Stocks and Glows, pp 231-241</p> <p>8.1.2. The Importance of Intuition</p> <p>8.1.2.1. Back of the envelop calculations<sup>16</sup></p> <p>8.2. In-class</p> <p>8.2.1. Adding dynamics to the supply chain model</p> <p>8.3. Discussion Assignment</p>	<p>10-20-8</p>
<p>9. Closing the Loop: Dynamics of Simple Structures</p> <p>9.1. Reading Assignment</p> <p>9.1.1. Sterman Chapter 8: Closing the Loop: Dynamics of Simple Structures (a dense chapter)</p> <p>9.2. In-class</p> <p>9.2.1. An Introduction to Bolstorff and Rosenbaum</p> <p>9.3. Discussion Assignment</p>	<p>10-27-8</p>
<p>10. An Introduction to the SCOR Model; Planning and Metrics</p> <p>10.1. Reading Assignment</p> <p>10.1.1. Bolstorff and Rosenbaum: Introduction, Chapters 1, 3, 4, and 6<sup>17</sup></p> <p>10.1.2. Supply-Chain Council: Supply-Chain Operations Reference-Model Overview Booklet Version 9.0<sup>18</sup></p> <p>10.2. In-class</p> <p>10.2.1. Examination of SCOR</p> <p>10.2.1.1. The concepts of usefulness and usability</p>	<p>11-3-8</p>

<sup>16</sup> Henry Petroski, Remaking the World: Adventures in Engineering (New York: Alfred A. Knoff, Inc., 1997) 0-375-40041-9

10.3. Discussion Assignment 10.3.1. Map the module 7 model to SCOR	
11. SCOR Model: As-Is 11.1. Reading Assignment 11.1.1. Bolstorff and Rosenbaum: Chapters 7,8, and 9 11.2. In-class 11.2.1. Translating company-speak into SCOR-speak	11-10-8
12. SCOR Model: To-Be 12.1. Reading Assignment 12.1.1. Bolstorff and Rosenbaum; Chapter 12,13, 14, 15 and 17 12.1.2. Gabel and Pilnic: Chapter <sup>19</sup> 12.2. In-class 12.3. Discussion Assignment 12.3.1. Assess the relevance of SCOR-BD model from module 11 to Fowlers Inc.	11-17-8
13. SCOR Model: Getting from Here to There 13.1. Submit business dynamics-based description of the supply chain (2/3 credit)	11-24-8
14. Control: What, Why, and How 14.1. Reading Assignment: 14.1.1. Drogan: Control 14.2. In-class 14.2.1. What is the nature of the relationship between metrics and business dynamics? 14.3. Return questions prompted by the business dynamics-based description of the supply chain	12-1-8
15. Things Not Yet Mentioned 15.1. Data Planning 15.2. Change Management <sup>20</sup> 15.3. Financial versus Logical Implementation Planning 15.4. In-class 15.4.1. Return answers to questions prompted by the business dynamics-based description of the supply chain (1/3 credit)	12-8-8

<sup>17</sup> Peter Bolstorff and Robert Rosenbaum, Supply Chain Excellence : A Handbook for Dramatic Improvement Using the Scor Model, 2nd ed. (New York: AMACOM-American Management Association, 2007) 0814409261

<sup>18</sup> Supply-Chain\_Council, Supply-Chain Operations Reference-Model Overview Booklet Version 9.0, 2008 2001, PDF, Supply-Chain Council, Inc., <http://www.supply-chain.org/galleries/public-gallery/SCOR%209.0%20Overview%20Booklet.pdf>, [April 30, 2008]

<sup>19</sup> Jo Ellen Gabel and Saul Pilnick, The Shadow Organization in Logistics: The Real World of Culture Change and Supply Chain Efficiency (Oak Brook: Council of Logistics Management, 2002) 0-965-86536-3

<sup>20</sup> Wikipedia, Change management (people), [http://en.wikipedia.org/wiki/Change\\_management\\_\(people\)](http://en.wikipedia.org/wiki/Change_management_(people)) [July 6, 2008]

James Drogan  
July 6, 2008

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