MARITIME COLLEGE
STATE UNIVERSITY OF NEW YORK

Institutional Syllabus – TMGT 8510-01 System Design And Control

Spring 2014

I. COURSE DESCRIPTION

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 ("Graduate Catalog," 2008, p. 21).

3.000 Credit hours

3.000 Lecture hours

Prerequisite(s): TMGT 7XXX Core Courses

Corequisite(s): None

Follow-On Courses: None

Role in Curriculum: Elective and certificate course

II. TEXT(S)

A. Required Text(s):

1. Drogan, James. *System Design and Control: TMGT 8510*. McGraw-Hill Primus, 2008, 0-39-041036-5. This is a custom printed version of Parts I , II and VII of Sterman, John. *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Boston: Irwin/McGraw-Hill, 2000, 0-072-31135-5.

   Text is available at the Maritime Ship's Store.

2. Martin, R. L. (2009). *The Opposable Mind*. Boston: Harvard Business Press.

   Text is available through Amazon.com in paperback and Kindle editions.

B. Additional Material:

Distributed through ANGEL

III. STUDENT LEARNING OBJECTIVES

A. Course Objectives

1. The student is expected to be able to understand and apply the concepts and principles associated with:

a. The nature of systems; origins, purposes and characteristics.

b. The criteria that influence the design of systems; contexts and dynamics.

c. The control of systems; sense, interpret, decide, act, and learn.

2. The student will receive a broad view of systems analysis that will enhance their ability to understand and work towards improving the performance of systems. The supply chain constitutes the system of focus.

   a. Business dynamics, analysis, and design tools are introduced.

   b. The course examines system design and control from various points of view in the following context (James Drogan, 2009a).

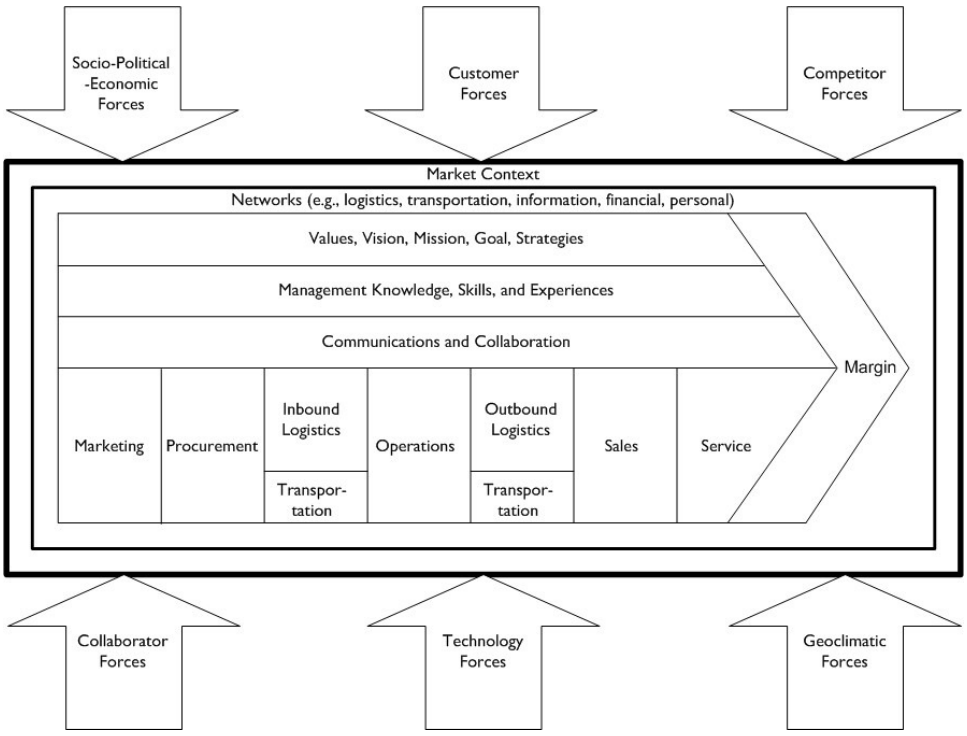


Figure 1 The Context of Interest

3. The student will come out of this course with improved knowledge and skills in the subject matter, critical thinking and communications. This is intended to enhance their ability to make a meaningful contribution to improving system performance.

IV. COURSE ASSESSMENTS

A. Assessments in the Class

Participation in online and in-class discussion

Teamwork

Project

B. External Assessments

None

V. ACCOMMODATIONS FOR STUDENTS WITH LEARNING DISABILITIES

If you believe that you need accommodations for a disability (also referred to as IEPs and 504 plans), please notify me within the first week of class and contact the Office of Accessibility Services at (718) 409-7348 or email Associate Dean William Imbriale at wimbriale@sunymaritime.edu for an appointment to discuss your needs and the process for requesting accommodations. Since accommodations may require early planning and generally are not provided retroactively, please contact Accessibility Services as soon as possible!

VI. ACADEMIC INTEGRITY POLICY

Absolute integrity is expected of every Maritime student in all academic undertakings.

A Maritime student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic position truthfully reported at all times. In addition, Maritime students have a right to expect academic integrity from each of their peers.

Students are expected to do their own work in class, on assignments, laboratory experiments, and examinations or tests in accordance with the directions given by the instructor. It is the responsibility of all students to read and understand this statement of College policy on academic integrity. Maritime College considers the violation of academic integrity a serious matter, and one that will be treated as such.

A student who violates academic integrity may, depending on the nature of the offense, be subject to one or more of the following measures: failure of the assignment or examination, failure of the course, dismissal from the Regiment of Cadets, or dismissal from the College. Violations of academic integrity, also known as academic dishonesty, are subject to review by the Judicial Board. For details, go to:

http://www.thezonelive.com/zone/02_SchoolStructure/NY_SUNYMaritimeCollege/handbook.pdf

ALL ACADEMIC INTEGRITY VIOLATIONS WILL BE REPORTED TO THE DEAN OF STUDENTS

TMGT 8510-01 System Design And Control

Spring 2014

INSTRUCTOR INFORMATION

Prof. James Drogan, jdrogan@sunymaritime.edu, 718-409-7289

Office hours: 9AM – 3PM Monday – Thursday Fort B30. Appointments are preferred.

CLASS MEETINGS

510PM – 740PM, Thursday

Fort A06

CLASS POLICIES

Attendance is mandatory. Please notify the instructor by any available means if you expect to be absent.

GRADING

Grading comprises:

1. Attendance (15)
2. Online discussion (70)
3. Participation in class (14, extra credit)
4. Project (75)
5. Teamwork (25)

Total points is 185 (plus 14 extra credit; counted in the numerator).

No makeup work will be assigned and no other extra credit is available.

Final Grade Assignments

The initial final grade is assigned according to the following table.

%	GPA	Grade
100.0%	4	A
93.0%	4	A
90.0%	3.7	A-
87.1%	3.3	B+
83.0%	3	B
80.0%	2.7	B-
77.1%	2.3	C+
73.0%	2	C
70.0%	1.7	C-
67.1%	1.3	D+
63.0%	1	D
0.0%	0	F

The initial final grade represents the points attained divided by the total points available. This mathematical guides me in the assignment of the final grade. What this means is that the final grade I assign may be different from the mathematical grade. In assigning the final grade I take into account your consideration, respect, and encouragement of others; your desire for learning and discipline in completing the assignments; your ability to bring relevant issues to the attention of the class.

COURSE OUTLINE

Overview

We are surrounding by systems – banking, transportation, medical, education for example – that we often take for granted simply because they are such a regular part of our lives. We often don't give much thought to what constitutes these systems, why they exhibit certain aspects of behavior, why they fail, what distinguishes a good system from a poor system.

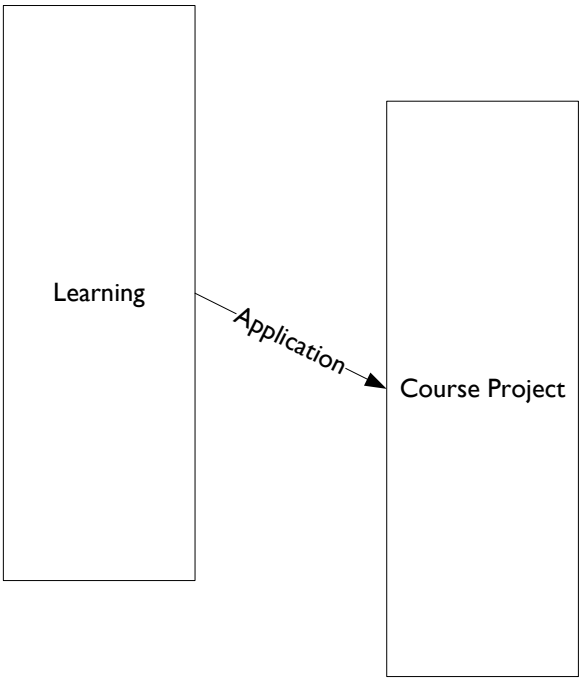
And, in fact, if systems are not our principal responsibility and if they provide the outcome that satisfies us, then we likely don't wish to know any more. This is a natural human reaction, but I find it somewhat unsatisfying not to know how and why systems act the way they do.

My experience with system design and control began in my youth when I worked for my father, a carpenter. This experience received a more formal emphasis when I began working for IBM in 1965 and subsequent to that time I have participated in a considerable amount of system design and control activity – some a success, some not.

I bring this experience into the picture to suggest that this note is not only about some of the theoretical aspects of system design and control, but also about actually trying to get things accomplished. Hence, along the way, I will discuss a few bumps and bruises, how I think they happened and, therefore, what you may be able to do to avoid similar bumps and bruises.

I don't propose that what is here is the only way to think about system design and control. The power that one must develop to be effective in the discipline of system design and control results from an internalization of the thinking of others as well as your own. Let me be clear. Your ability to be competent at system design and control results from your belief in your understanding of and ability to apply the principles and practices of the discipline. Reading this note and books, listening to practitioners in the field is not sufficient. You need to make the discipline yours (James Drogan, 2008a).

This course comprises two parallel streams of activity. The first is the learning that is done through formal lectures, reading, and discussions. The second is the course project.



As one might expect the learning starts first and the course project ends last.

Course Design

The course comprises 15 modules covered in 15 course meetings. The fifteenth meeting will be during normal class time in finals week.

The Modules

A description of the objective for each of the modules is given along with the assigned reading. The principal texts are Sterman (the custom printed version referred to above) and Martin (referred to above). Lecture notes and links to other material will be on ANGEL.

1. Introduction to the Course and to System Design and Control
    a. Description

        In an increasingly complex, rapidly-changing, and opaque world, the design of systems in order to sense, interpret, decide, act, and learning about the world in order to more-or-less respond to developments in an intelligent fashion becomes increasingly critical. This course takes up the issues implicit in this first sentence, aiming to provide the student with knowledge and skills apropos to successfully taking up this challenge.

        This module also introduces the project for the course, *China Set to Tax US-Made Car Imports* (Reed & Beattie, 2011).

    b. Reading

        Choices, Conflict, and the Creative Spark (Martin, 2009, Chapter 1)

        Enron: The Drama Goes to trial ("Enron: The Drama Goes to Trial," 2006)

        Introduction to the Course and to System Design and Control (James Drogan, 2008a)

        System Dynamics 101(Sgouridis, 2006)

        Why Webvan Drove Off a Cliff (Glasner, 2001)

    c. Discussion Online

        What You Know

        You come into this course with some level of knowledge about system design and control encompasses. Please discuss this level. Also read and respond to what your classmates have to say. Thinking about the associated what, why, how, when, where, and why may be a helpful approach.

2. Learning In and About Complex Systems
    a. Description

        Systems are complex not only in their design and structure, but also with respect to the dynamic forces encountered and to which the system must respond. It is not enough to think of systems as static. In particular, there is a need for systems to be adaptive in order to contend with the aforementioned dynamics.

    b. Reading

        An Introduction to System Design and Control (James Drogan, 2008a)

        Business Dynamics: Systems Thinking and Modeling for a Complex World (Sterman, 2000, Chapter 1)

        No Stomach for Second-Best (Martin, 2009, Chapter 2)

        Psychology of Intelligence Analysis. Central Intelligence Agency (Hueuer, 1999, pp. iii, v–vii. ix–xi, xiii–xv)

        System Dynamics and the Lessons of 35 Years. Massachusetts Institute of Technology (Forrester, 1991)

    c. Discussion Online

        The Advice of the Authors

        What advice are the authors giving regarding analysis and systems dynamics?

        How does this advice apply to the course project?

3. System Dynamics in Action
    a. Description

        Here we examine some real cases and explore how system dynamics was applied to facilitate the desired outcome.

    b. Reading

        Business Dynamics: Systems Thinking and Modeling for a Complex World (Sterman, 2000, Chapter 2)

        Reality, Resistance, and Resolution (Martin, 2009, Chapter 3)

c. Discussion Online

System Characteristics

Systems most amenable to systems thinking possess certain characteristics. The existing system associated with the importation of automobiles from the US to China also has a set of characteristics.

How do these two sets of characteristics align?

What are the implications of this alignment on our ability to define the type of solution called for in Introduction to the Course Project?

What conclusions can we draw about our potential for success?

What actions are suggested that might improve our chances for success?

4. The Modeling Process

a. Description

A critical step in applying the principles of system dynamics to the resolution of issue is the development of a model that is calibrated to reality. We take up this matter in this module.

b. Reading

Business Dynamics: Systems Thinking and Modeling for a Complex World. Chapter 3 (Sterman, 2000, Chapter 3)

Cultural Acumen for the Global Manager: Lessons from Project GLOBE. Organizational Dynamics, 29(4), 289-305 (Javidan & House, 2001)

Dancing Through Complexity (Martin, 2009, Chapter 4)

c. Discussion Online

Major Differences Between China and the US

China and the US are arguably the two hegemons of the modern world. The countries are founded on two substantially different cultural and economic models. In what ways do these differences affect our solution?

5. Structure and Behavior of Dynamic Systems
    a. Description

        While Sterman asserts "The behavior of a system arises from its structure" (p. 109), it may well be true that the structure is shaped by its behavior. This module takes up these two items.

    b. Reading

        An Introduction to the Supply Chain (James Drogan, 2008b)

        Business Dynamics: Structure and Behavior of Dynamic Systems (Sterman, 2000, Chapter 4)

        Mapping the Mind (Martin, 2009, Chapter 5)

    c. Discussion Online

        Principal Dynamics in the Project Supply Chain

        Systems are aimed at sensing and, when practical, responding to dynamic forces. Some of these are generated internally and some externally.

        What are some of the principal dynamics with which we will need to contend in our solution? What gives them significance? What behavior does our solution need to exhibit in order to deal with these forces?

6. Causal Loop Diagrams
    a. Description

        Pictures, diagrams, sketches are often the most valuable mean of communicating ideas (James Drogan, 2007). This module takes up a particular form of this aid to communication.

    b. Reading

        Business Dynamics: Structure and Behavior of Dynamic Systems (Sterman, 2000, Chapter 5)

        The Construction Project (Martin, 2009, Chapter 6)

        The Role of Visualization in Communication (James Drogan, 2007)

c. Discussion Online

The Relationship Between Key Variables in the China Case

We have been discovering the key variables in the China case. Now we need to understand the manner in which these variables are related. It is the relationship between variables that provides the dynamic nature we are seeking to understand and subsequently control.

You are encouraged to use causal loop diagrams. These may be drawn using a tool, including pencil and paper, with which you are familiar.

7. Stocks and Flows

a. Description

In a system, a supply chain for example, stocks, such as inventory, accumulate. Inventory, of course, serves as a buffer between components of the supply chain and carries with it associated costs. Causal loops, of and by themselves, do not account for this. Hence, we need stocks and flows.

b. Reading

A Leap of the Mind (Martin, 2009, Chapter 7)

Business Dynamics: Structure and Behavior of Dynamic Systems (Sterman, 2000, Chapter 6)

c. Discussion Online

Critical Stocks and Flows in the China Case

Variables represent change in terms of units per time. For example, the variable that measures the number of items purchased on any particular day says nothing about how many items are on the shelf. And yet, as we know from our study of logistics, the items on the shelf (i.e., the inventory) is very important tem of information. To understand this, we create a stock.

Some key variables do not naturally lead to a meaningful stock. For example, household electricity usage is a variable measured in kilowatt hours, but it would, it most circumstances, be meaningless to create a stock called kilowatt hours available.

What are the essential stocks we need to consider in the China case? How are the related to the variables we have previously identified?

8. Dynamics of Stocks and Flows

a. Description

Perhaps the intent of this module is best captured by the opening words in chapter 7 of Sterman attributed to Ian Stewart.

"The successes of the differential equation paradigm were impressive and extensive. Many problems, including basic and important ones, led to equations that could be solved. **A process of self-selection set in, whereby equations that could not be solved were automatically of less interest than those that could** [emphasis added]".

To that I would add: "If stated reasons don't sit well with your conscience or stand the test of logic, look for deeper motivations." Docent Glax Othn in Brian Herbert and Kevin J. Anderson, *Dune: The Butlerian Jihad* , 1st Edition ed. (Tor Books, 2002).

This module takes up, if you will, common sense as a key element of system dynamics.

b. Reading

A Wealth of Experience (Martin, 2009, Chapter 8)

Business Dynamics: Dynamics of Stocks and Flows (Sterman, 2000, pp. 231–241)

Remaking the World: Adventures in Engineering. New York: Alfred A. Knoff, Inc. (Petroski, 1997, pp. 47–55)

c. Discussion Online

Desk Checking the China Case

Computing Dictionary

desk check definition
programming
To grovel over hardcopy of source code, mentally simulating the control flow; a method of catching bugs. No longer common practice in this age of on-screen editing, fast compiles, and sophisticated debuggers - though some maintain stoutly that it ought to be.
Compare dry run, eyeball search, vdiff, vgrep.
[Jargon File]
(1996-05-13)

The origin of the phrase "desk check" is doubtless lost in the dim, distant history of computer science and its predecessors. Certainly it was in existance some 48 years ago when the instructor for this course became inolved with in what was called, in those days, the data procesing industry.

The apt words from the definition to the right (courtesy of dictionary.com) are "mentally simulating." One sits at a desk (or, in these days, a computer screen) simulating what is laid out before one. In a sense, the mind became the computer and was guided by what was on the desk.

While no chess player, this seems to me to be what a chess player does as he or she prepares to make a move. Simulation in the mind, examining the short and long term implications of each alternative preparatory to making and executing the alternative that has the best potential outcome for the player.

In this discussion we take up the desk checking of our model in the China case. Have we properly described the variables, stocks, flows, and their relationships? Have we omitted something important? Have we overemphasized something that is of little consequence?

9. Closing the Loop: Dynamics of Simple Structures
    a. Description

        Business dynamics (frequently referred to in this course as system dynamics) is not a theoretical, pie-in-the-sky, equation based and computational heavy exercise of little practical value. The examples from Sterman and what we have so far discovered in this course should be sufficient proof that there is practical and potentially valuable application of the concepts that have been covered to this point.

        This module is that last of those that constitute our examination of system dynamics in this course. It's therefore time to take stock of system dynamics and the manner in which relates (or does not as the case may be) to the world around us.

    b. Reading

        Business Dynamics: Closing the Loop: Dynamics of Stocks and Flows. (Sterman, 2000, Chapter 8)

        The Plan for the Project (James Drogan, 2012a)

c. Discussion Online

The Value of System Dynamics within the Context of the China Case

We're a bit over halfway through the schedule for this course. Our understanding of the issue to be resolved ought to be fairly well developed as should be our appreciation for a number of tools and techniques for helping us arrive at an acceptable outcome.

The discussion this week takes up a single question. Are we on a path that will get us to our destination?

If so, what is the evidence?

If not, why and what should we do?

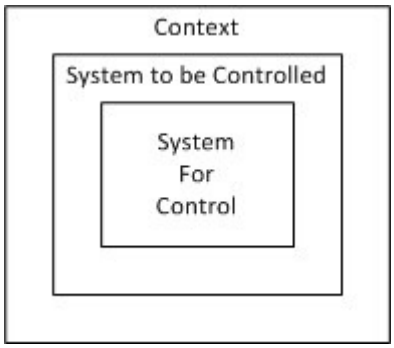
It's easy to become absorbed by the detail and fail to pick our heads up from time to time to check whether 1.) we're on path to get to the destination and 2.) whether the destination is still correct. Of course we should be be asking these questions continuously throughout the life of the project, but from time to time it is useful to take these as the major questions for discussion.

"There is nothing so useless as doing efficiently that which should not be done at all." Peter F Drucker

10. Solution Behavior

a. Description

Our task is to design and implement a system of control that will affect the system to be controlled that is embedded within a larger context. That is, the system that supported the Chinese in making their decision was itself affected by other forces in the larger context.



The control system comprises processes, information, and people integrated together (i.e., the business system) in support of business decisions for achieving the goals and objective of the business. This

business system is enabled, but never entirely subsumed, by the technology system. The technology system is itself comprises of various components (e.g., processors, devices, storage, software, and the like) that is in constant and rapid change. It seems of somewhat low value, if not useless, to therefore describe the control system in terms of how it is built. Rather, we should describe it in terms of how the control system behaves (Ashby, 1963). In the next module the solution will be structured to deliver the required behavior.

This module takes up the question of the specification of behavior, the external view of the solution.

b. Reading

A Note on Business Drivers, Business Configuration, and Information Technology Strategy (James Drogan, 2005a, pp. 4–7). Begin on p 4 with "The connection between the business configuration…" and end just prior to "Reach, range, and behavior…" on p 7.

Note on Building a Management System (James Drogan, 2005b)

c. Discussion Online

Behavior of the Solution

When we invest we generally like to have some idea of whether the performance of the investment has the potential of aligning with our desires. That is, desires come first.

And so it should be with systems. That is we should invest in systems that are likely to behave as we expect.

In this discussion we take up the specification of the desired behavior of the control system. Underlying this are two key characteristics. First, identifying the important behavioral characteristics. Second, assuring that the set is sufficiently complete.

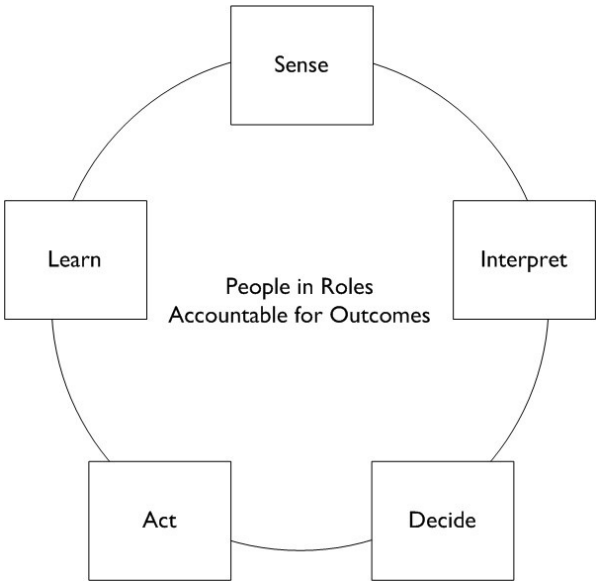
Please read *Framing Discussion 10: Behavior of the Solution* (James Drogan, 2012b) before you participate in this discussion.

11. Solution Structure

a. Description

In the previous module we treated the solution as a "black box," not caring what was in the box, but only caring about how it behaved. Now, however, we need to structure the solution to deliver the necessary behavior.

The structure of the solution comprises a combination of processes, data, and people enabled by information technology (interconnected hardware and software) that is connected to the context and enables high-performance SIDAL loops (James Drogan, 2008a).



b. Reading

Information System Fundamentals (J. Drogan, 2005)

c. Discussion Online

The Symbiotic System

This topic discussion emerges from many discussions with Dr. Marvin L. Manheim, first when he was at MIT, then later when he moved to Northwestern. While these discussions were wide-ranging, those that I remember most were those that focused on symbiotic decision support systems (SDSS).

Dr. Manheim, as I recall, defined SDSS as the optimum combination of the human and the computer that would create the most the most effective and efficient decisions within a given context.

In this discussion we consider SDSS within the context of the course project.

12. Completing the Connection to the Context

a. Description

The solution is bounded and on the other side of the boundary is the context in which the solution exists. The solution is connected to the context by means of two types of messages, 1.) what the context needs to know from the solution and 2.) what the solution needs to know from the context.

This module takes up this notion of connection between the solution and the context.

b. Readings

The Context of Interest (James Drogan, 2009a)

The Global Reporting Initiative ("Global Reporting Initiative Home Page," 2007)

c. Discussion Online

Connecting the Context and the Solution

It seems impossible, or at least highly improbable, that a system can exist of and to itself, apart from at least on other system. This codependency exists because each -- the solution and the context in our case -- requires something from the other in order to function.

This discussion takes up this matter of connection. How and why do these connections need to be made?

13. Implementation

a. Description

System design and control implies an implementation step that connects design with control. That is not the notion that implementation is taken to mean in this module. Rather, we take up the idea of the manner in which implementation concerns influence the design of systems that will manifest the desired control.

We are seeking to minimize system designs that, upon implementation, do not provide sufficient return on investment.

b. Readings

None

c. Discussion Online

The Interrelationship between Design and Implementation

One can design systems that cannot be implemented. I've had a bit of first-hand experience at this.

What then is the nature of the relationship between design and implementation? How, when, and by whom is this relationship established? Who should be responsible for the relationship?

14. A Few Loose Ends

a. Description

In every endeavor there are matters, seemingly small, that underpin success.

> For want of a nail the shoe was lost.
> For want of a shoe the horse was lost.
> For want of a horse the rider was lost.
> For want of a rider the message was lost.
> For want of a message the battle was lost.
> For want of a battle the kingdom was lost.
> And all for the want of a horseshoe nail (Anon, 2009).

Experience suggests that all of these matters may not be able to be identified. This becomes increasingly problematical as the complexity of the system increases. The era of the shade tree mechanic long ago gave way to the automobile technician working in a near spotless environment manipulating a computer for diagnoses and configuration.

We take up a few of these matters in this concluding module.

b. Readings

Data, Information, and Knowledge - Relevance and Understanding (James Drogan, 2009b)

When Technology Fails (James Drogan, 2008c)

Operations Rules 2012: Mitigating Supply Chain Risk (Gilmore, 2012)

c. Discussion

None

Schedule

#	Date	Day	Topic
1	1/16/14	Thursday	M1: Introduction to the Course and to System Design and Control; Introduction to the Course Project (China Set to Tax US-Made Car Imports)
2	1/23/14	Thursday	M2: Learning in and About Complex Systems
3	1/30/14	Thursday	M3: Business Dynamics in Action
4	2/6/14	Thursday	M4: The Modeling Process
5	2/13/14	Thursday	M5: Structure and Behavior of Dynamic Systems
6	2/20/14	Thursday	M6: Causal Loop Diagrams
7	2/27/14	Thursday	M7: Stocks and Flows
8	3/6/14	Thursday	M8: Dynamics of Stocks and Flows
9	3/13/14	Thursday	M9: Closing the Loop: Dynamics of Simple Structures
10	3/20/14	Thursday	M10: Solution Behavior (External View)
11	3/27/14	Thursday	M11: Solution Structure (Internal View)
12	4/3/14	Thursday	M12: Completing the Connection to the Context
13	4/10/14	Thursday	M13: Implementation
	4/17/14	Thursday	Sprng Break - No Classes
14	4/24/14	Thursday	M14: A Few Loose Ends
15	5/1/14	Thursday	M15: Project and Course Review

Course Project

When the Chinese announced the imposition of a tariff on cars imported from the United States an initial reaction by anyone in the affected automobile supply chain may have been:

1. How does this impact my business?
2. What actions could I take to mitigate this impact?
3. What action should I take and why?

The first deliverable in the course project is the design of a system that yields answers to these questions.

The second deliverable answers the more interesting question:

1. How could I have been forewarned on this development?

In a complex, rapidly changing, opaque world, the currencies of most value are insight and time.

> "I believe that we're about to witness what may turn out to be the last competitive frontier business will see. It's going to be a war over the one priceless resource. Time. And when it comes, trust may turn out to be the best investment anyone's made."[1]

You may gain a significant advantage if you can move before your competition.

[1] Jim Kelly, CEO of UPS, Remarks to the Commonwealth Club of San Francisco & Oakland Chamber of Commerce, February 23, 2000.

The first deliverable carries 50 of the 75 total points available for the project; the second deliverable carries the remaining 25 points.

Teamwork

You will be placed on a team with four to five other members depending upon the number of students registered for the course. The composition of the teams will be one that aims at mixing cultures as much as possible. I will decide the composition of the teams. These will be posted in ANGEL no later than the end of the second week.

(i) All members of the team will receive the same grade for the papers. There may be circumstances to indicate this should not be the case and I reserve the right to give different grades to team members based upon these circumstances.

(ii) After the final paper is submitted I will ask each team member to assess the performance of his or her teammates. This assessment carries 25 points.

I will entertain notions that you should not be on a team and thus solely responsible for al the work in the course. I am not in favor of this arrangement for I don't believe it helps develop the spirit and capabilities required for working on teams. You will, more likely than not, find yourself working on teams in the future. Prepare yourself to be able to deliver value in these situations.

ASSESSMENT (this section pertains to the instructor)

In III.A on page 1 it was called out that the student is expected to be able to understand and apply the concepts and principles associated with:

1. The nature of systems; origins, purposes and characteristics.
2. The criteria that influence the design of systems; contexts and dynamics.
3. The control of systems; sense, interpret, decide, act, and learn.

Assessment is the process whereby student accomplishment in these three areas is determined. Assessment is related to, but different from the manner in which your grade is determined. Assessment provides information that helps improve the quality of the course. Four tools (columns) are used to make this assessment.

	In-Class Discussions	Online Discussions	Research	Insight[2]
1. The nature of systems; origins, purposes and characteristics.	4	4	2	1
2. The criteria that influence the design of systems; contexts and dynamics.	2	2	1	1
3. The control of systems; sense, interpret, decide, act, and learn.	2	2	1	1
	Culminates in the Project Report			

Table 1 Course Objectives, Assessments Tools, and Emphasis

The more precise objective in each of these 12 cells is indicated by:

Major (4): Students can integrate concepts and apply them to novel situations. Topics have been fully developed and reinforced throughout the course; a "mastery knowledge."

Moderate (2): Students are given opportunities to 'practice or apply concepts.' Topics are further developed and reinforced in the course; "working knowledge or application of knowledge"

Minor (1): Students are introduced to the outcome. Topics are introduced in course lectures, labs, homework, assignments, etc; a 'talking knowledge' or awareness[3]

[2] Insight is applied to that material, written or oral, the student provides that is lies on the long tails of the distribution of thinking in the class and provides insight and incentive beyond what one would normally expect.

TMGT 8510 is a course within the Master of Science in International Transportation Management (MS ITM) degree program as an elective course and as a required course for the Supply Chain Management Certificates.

The MS ITM program has adopted six fundamental outcomes represented as columns in the following table.

Identify issues clearly, formulate hypotheses, collect data, and evaluate	Apply leadership skills	Express ideas clearly, concisely and persuasively	Integrate ethical viewpoints into all aspects of one's life	Understand the dynamic issues of international transportation management	Know the basic principles, skills, and tools of international transportation management
4	2	4	4	2	1

Table 2 MS ITM Objectives and Course Emphasis

Table 2 indicates the emphasis in this course relative to the outcomes of the MS ITM program. Table 2 represents the second portion of the assessment of the course.

[3] Key as defined Faculty Day (Dec, 2008); redistributed March 18, 2012 email

An assessment rubric is suggested by the above tables.

	The nature of systems; origins, purposes and characteristics.	The criteria that influence the design of systems; contexts and dynamics.	The control of systems; sense, interpret, decide, act, and learn.
Identify issues clearly, formulate hypotheses, collect data, and evaluate			
Apply leadership skills			
Express ideas clearly, concisely and persuasively			
Integrate ethical viewpoints into all aspects of one's life			
Understand the dynamic issues of international transportation management			
Know the basic principles, skills, and tools of international transportation management			

Table 3 Assessment Rubric

Overall assessment involves an interpretation of student performance on the following basis:

1. Student performance exceeded expectations.
2. Student performance met expectations.
3. Student performance failed to meet expectations.

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