

INF 1006 Workshop: Systems Thinking, Systems Design

Winter Semester, 2019

Instructor: Professor Christoph Becker

Time: Monday 1pm-4pm

Venue: BL 728

Course Description

Most of us lack an intuitive conceptual grasp of complex environments and their systemic interactions. We tend to criticize simplistic ways of thinking, but find it difficult to make constructive suggestions for how to deal with challenging situations where social, technological and humanistic questions interact. Information professionals in particular are keen on interdisciplinary engagement, but often find it challenging to engage with formal representations of complex systems, conceptual models of social and technical environments, and epistemic questions around such models.

This workshop aims to provide students with an initial conceptual toolset to bridge disciplinary modes of thinking. It introduces systems thinking frameworks as mental devices to illuminate and critically interrogate key concepts, assumptions, frameworks and modes of engagement. Through these frameworks, it explores the multi-faceted nature of sustainability and the role of information systems and technology design in addressing it. We will use systems thinking games, collaborative modelling and case studies to explore the role of systems design in social, environmental and economic sustainability and discuss roles and responsibilities for information professionals in this space.

Goals and Objectives

Students completing this course will have gained an overview of the systems thinking universe, will be able use key conceptual tools in professional interactions, and be ready to expand on this toolset in multiple directions.

1. They will be conversant in the plurality of systems thinking perspectives and able to navigate key conceptual frameworks and their terminology in their future development and learning trajectory.
2. They will be able to appreciate concrete system thinking frameworks such as system dynamics and soft systems methodology and apply systems thinking tools to collaboratively tackle complex problem situations.
3. They will demonstrate a systemic perspective of the critical role and opportunities of information technology design in social, environmental and economic sustainability.
4. They will be comfortable in unpacking mental models and reflecting on their assumptions and consequences.

Relationship between Course Learning Outcomes and Program Learning Outcomes
(<http://current.ischool.utoronto.ca/studies/learning-outcomes>):

- The diverse concepts and practices of systems thinking (1) will help them to navigate the shifting inter-disciplinary horizons of the information disciplines (SLO 1 and 6).

- Systemic ways of thinking (2) lie at the heart of understanding complex systems and worldviews across social, natural, humanistic, economic and technical disciplines (SLO 1).
- Systems perspectives on technology design and sustainability (3) will enable them to lead interdisciplinary conversations involving diverse stakeholders (SLO 2) and identify the impact of technological developments on society (SLO 5).
- The ability to unpack the assumptions underpinning our mental models and reflect on their consequences (4) is a crucial ingredient to life-long intellectual growth (SLO 6).

Course Summary

What gap does the course aim to address?

We teach how to use various frameworks to model and reason about ‘information systems’, but within the MI program, we have no place where we dive deeper into the trans-discipline of systems thinking itself. This workshop introduces students in any concentration to constructive ways of *thinking in systems*. It provides a rough roadmap to this universe and explores central concepts through concrete, challenging questions.

What do we mean by ‘systems thinking’?

Systems thinking comes in many different forms. These forms grew historically out of multiple parallel developments in diverse fields including biology, operations research, industrial control theory, cybernetics, sociology, and critical theory. The label “systems thinking” has been applied to very different ways of thinking, and we cannot explore each of these in detail. Instead, we will emphasize and explore the plurality of perspectives. The following description provides an informal set of characteristics of the mindset of systems thinking that works well as a starting point. In this characterization, a “systems thinker”

- *“Sees the whole picture.*
- *Changes perspectives to see new leverage points in complex systems.*
- *Looks for interdependencies.*
- *Considers how mental models create our futures.*
- *Pays attention to and gives voice to the long-term.*
- *“Goes wide” (uses peripheral vision) to see complex cause and effect relationships.*
- *Finds where unanticipated consequences emerge.*
- *Focuses on the structure, not on blame.*
- *Holds the tension of paradox and controversy without trying to resolve it quickly.*
- *Makes systems visible through causal maps and computer models.*
- *Seeks out stocks or accumulations and the time delays and inertia they can create.*
- *Watches for “win/lose” mindsets, knowing they usually make matters worse in situations of high interdependence.*
- *Sees oneself as part of, not outside of, the system.” (Sweeney&Meadows, p.2)*

We will look in detail at system dynamics as one very practical systems thinking mindset, and will explore key concepts in general systems theory, but also contrast this with very different perspectives such as Soft Systems Methodology and Critical Systems Thinking. The aim of this course is not to teach a modelling paradigm or even modelling in general, but to open up an appreciation of systemic ways of thinking and the collaborative nature of such thinking.

To make all these abstract concepts tangible, we will focus on one challenging set of ‘wicked problems’ – the role of technology design in sustainability. In this space, the limitations of the

reductionist problem-solving mindset that dominates science and engineering curricula become especially striking. Information professionals have enormous opportunities to play central roles at the intersection of technology development and social understanding. The workshop is a starting point.

The lectures draw on literature from system dynamics, climate science, management, policy studies, human-computer interaction, psychology, moral philosophy, soft systems methodology, critical systems thinking, and the emerging field of ICT for sustainability. Required readings are selected to provide an entrance point and overview.

How are we going to bring this together in six weeks?

The workshop schedule combines a few dense lecture periods based on foundational readings (and incentives to complete them on time) with systems thinking games – group activities of different length in which we experience particular phenomena first-hand and then discuss the emergent properties we observe in those games in terms of systems thinking concepts. We will jointly develop some models of system behaviors using example scenarios, and thus gain experience in possible ways to think *in systems*. We will focus on IT systems design and *sustainability* because these topics lend themselves especially well to systemic exploration.

The group project will then provide an opportunity to dive deeper into a particular environment and apply systems thinking concepts and techniques to discuss challenges and opportunities.

There are a myriad ways to take this further, and if students at the end are so intrigued that they do that, the course has reached its most important goal.

Class Format

The class will meet for three hours each week. Most classes will combine lectures, systems thinking games and debriefing, and other activities; in some weeks, students will present and discuss their projects. On their own time, students must complete weekly course readings, submit written assignments and complete a small group project.

Prerequisites

Students from all concentrations are most welcome. An interest in information technology, systems design and different ways to think about complex questions are good starting points!

Course Materials

This course does not have a textbook. All required readings are available online. Links are included here. Additional readings are available as scans on Quercus.

Some great systems books to have (read):

Book	Important because....
Ramage, M., & Shipp, K. (2009). <i>Systems thinkers</i> . Dordrecht; New York: Springer. (online through UTL)	It provides a wonderful way of exploring the universe(s) of systems thinking through the selected writings of key figures; its collection covers a broad spectrum of these; and their biographies and summaries of their work are entertaining, but also very insightful. Try <i>Ackoff</i> for a very entertaining chapter.
Michael Jackson (2003): <i>Systems Thinking: Creative Holism for Managers</i> .	Don't be put off by the subtitle. Jackson provides a fantastically readable overview and critique of many relevant systems approaches from the perspective of management in the broadest sense. Highly insightful and concise. Great references. His aim is to support the creative holistic combination of these approaches.
Meadows, D. H., & Wright, D. (2008). <i>Thinking in systems: a primer</i> . Chelsea Green Pub.	It's the classic introductory book on system dynamics , written from a very readable perspective, with excellent examples and a long-term perspective on the human role in sustainability.
Senge, P. M. (1990). <i>The fifth discipline: the art and practice of the learning organization</i> . New York: Doubleday/Currency.	Senge was very influential in his systemic perspective on how organizations learn. The book introduces Systems Dynamics in the context of organizations . Some games we use in the course go back to the Fifth Discipline Fieldbook, the companion to this book. The book at times shows a naïve view on social reality and the role of 'business', but it contains a lot of useful insights.
Checkland, P. (1999). <i>Systems Thinking, Systems Practice: Includes a 30-Year Retrospective</i> . Wiley. (also Checkland & Scholes (1990). <i>Soft Systems Methodology in Action</i>)	A landmark work in systems thinking. Soft Systems Methodology is less <i>about</i> "soft systems" than a shift in mindset towards an interpretivist perspective. The book contains a succinct historical account of the emergence of systems thinking as a way to overcome the simplicity of reductionist approaches. It's important to read this book with the 30-year retrospective available online. Checkland & Scholes provide much more detail and experience reports on SSM.
West Churchman's 3 books on the Systems Approach	As advisor to Ackoff <i>and</i> Ulrich, he was deeply influential on the emergence of soft <i>and</i> critical systems thinking. "The Systems Approach" (more popular in style), "The Systems Approach and Its Enemies" (less so), "The Design of Inquiring Systems" (less).
Flood, R. L., & Jackson, M. C. (1991). <i>Critical systems thinking: directed readings</i> . Chichester; New York: J. Wiley.	An excellent introduction to critical systems thinking , this work combines landmark papers with key arguments and an excellent commentary that provides a succinct perspective on the emergence of critical perspectives in systems thinking.
Ulrich (1983). <i>Critical Heuristics of Social Planning : A New Approach to Practical Philosophy</i> . Bern: P. Hapt	The landmark book in Critical Systems Thinking, Ulrich's work develops his Critical Systems Heuristics from the foundations of Kant, Habermas and Churchman and illustrates it in two compelling cases. Not easy reading, but highly rewarding.
Midgley, G. (2000). <i>Systemic Intervention: Philosophy, Methodology, and Practice</i> . Springer.	His critical systemic perspective on crucial issues of boundary judgments, stakeholder participation, marginalization, and emancipation is ambitious and insightful. Boundary critique and systemic intervention are highly relevant concepts.

See schedule for required readings!

- Ackoff, R. L. (1971). Towards a System of Systems Concepts. *Management Science* (Pre-1986), 17(11).
- Ackoff, R. L., & Gharajedaghi, J. (1996). Reflections on systems and their models. *Systems Research*, 13(1), 13–23. [https://doi.org/10.1002/\(SICI\)1099-1735\(199603\)13:1<13::AID-SRES66>3.0.CO;2-O](https://doi.org/10.1002/(SICI)1099-1735(199603)13:1<13::AID-SRES66>3.0.CO;2-O)
- Becker, C., Chitchyan, R., Duboc, L., Easterbrook, S., Mahaux, M., Penzenstadler, B., ... others. (2014). The Karlskrona manifesto for sustainability design. arXiv Preprint arXiv:1410.6968. Retrieved from <http://arxiv.org/abs/1410.6968>
- Becker, C., Chitchyan, R., Duboc, L., Easterbrook, S., Penzenstadler, B., Seyff, N., & Venters, C. C. (2015). Sustainability Design and Software: The Karlskrona Manifesto. In *Proceedings of the 37th International Conference on Software Engineering - Volume 2* (pp. 467–476). <http://dl.acm.org/citation.cfm?id=2819009.2819082>
- Börjesson Rivera, M., Håkansson, C., Svenfelt, Å., & Finnveden, G. (2014). Including second order effects in environmental assessments of ICT. *Environmental Modelling & Software*, 56, 105–115. <https://doi.org/10.1016/j.envsoft.2014.02.005>
- Buchanan, R. (1992). Wicked Problems in Design Thinking. *Design Issues*, 8(2), 5–21. <https://doi.org/10.2307/1511637>
- Checkland, P., & Poulter, J. (2010). Soft Systems Methodology. In *Systems Approaches to Managing Change: A Practical Guide* (pp. 191–242). Springer, London. https://doi.org/10.1007/978-1-84882-809-4_5
- Easterbrook, S. (2014). From Computational Thinking to Systems Thinking. *Proceedings of the ICT4Sustainability Conference*. Retrieved from http://www.atlantispress.com/php/download_paper.php?id=13446
- Emery, F. E., & Trist, E. L. (1960). Socio-Technical Systems. In *Management Science Models and Techniques* (Vol. 2, pp. 83–97). Oxford, UK: Pergamon.
- Frederick, S., Loewenstein, G., & O’donoghue, T. (2002). Time Discounting and Time Preference: A Critical Review. *Journal of Economic Literature*, 351–401.
- Freeman, R., Yearworth, M., & Preist, C. (2016). Revisiting jevons’ paradox with system dynamics: Systemic causes and potential cures. *Journal of Industrial Ecology*, 20(2), 341-353. <http://dx.doi.org/10.1111/jiec.12285>
- Gardiner, S. M. (2006). A Perfect Moral Storm: Climate Change, Intergenerational Ethics and the Problem of Moral Corruption. *Environmental Values*, 15(3), 397–413. <https://doi.org/10.3197/096327106778226293>
- Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162(3859), 1243–1248. <https://doi.org/10.1126/science.162.3859.1243>
- Hilty, L. M., & Aebischer, B. (2015). ICT for Sustainability: An Emerging Research Field. In L. M. Hilty & B. Aebischer (Eds.), *ICT Innovations for Sustainability* (pp. 3–36). Springer. http://link.springer.com.myaccess.library.utoronto.ca/chapter/10.1007/978-3-319-09228-7_1
- Loewenstein, George, Scott Rick, and Jonathan D. Cohen. 2008. “Neuroeconomics.” *Annu. Rev. Psychol.* 59: 647–672.
- Meadows, D. H., & Wright, D. (2008). *Thinking in systems: a primer*. White River Junction, Vt.: Chelsea Green Pub. (*You may want to get this excellent book for yourself.*) [[ch.1&2](#)]
- Note that the link is only accessible from the UofT network. From outside, use a [VPN](#).
- Meadows, D. H. (n.d.). *Leverage Points: Places to Intervene in a System*. Retrieved February 16, 2018, from <http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/>

- Midgley, G., Munlo, I., & Brown, M. (1998). The Theory and Practice of Boundary Critique: Developing Housing Services for Older People. *The Journal of the Operational Research Society*, 49(5), 467–478. <https://doi.org/10.2307/3009885>
- Nilsson, M., Griggs, D., & Visbeck, M. (2016). Policy: Map the interactions between Sustainable Development Goals. *Nature*, 534(7607), 320–322. <https://doi.org/10.1038/534320a>
- Ostrom, E. (2008). Tragedy of the Commons. *The New Palgrave Dictionary of Economics*, 2. [[link](#)]
- Penzenstadler, B., Rauturi, A., Becker, C., Norton, J., Tomlinson, B., Silberman, S., & Richardson, D. (2016). Bridging Communities: ICT4Sustainability @iConference 2015. *Interactions*, 23(1), 64–67. <https://doi.org/10.1145/2843584>
- Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences*, 4(2), 155–169.
- Simon, H. A. (1991). The Architecture of Complexity. In *Facets of Systems Science* (pp. 457–476). Springer, Boston, MA. https://doi.org/10.1007/978-1-4899-0718-9_31
- Simon, H. A. (1996). *The sciences of the artificial*. MIT press.
- Sterman, J. (2000). *Business dynamics: systems thinking and modeling for a complex world*. Boston: Irwin/McGraw-Hill. (Some chapters are available as scans.)
- Strengers, Y. (2014). Smart Energy in Everyday Life: Are You Designing for Resource Man? *Interactions*, 21(4), 24–31. <https://doi.org/10.1145/2621931>
- Trist, E. L. (1981). *The evolution of socio-technical systems : a conceptual framework and an action research program*. Toronto: Ontario Ministry of Labour.
- Tversky, A., & Kahneman, D. (1981). The Framing of Decisions and the Psychology of Choice. *Science*, 211(4481), 453–458.
- Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, S251–S278.
- Ulrich, W. (1987). Critical heuristics of social systems design. *European Journal of Operational Research*, 31(3), 276–283. [https://doi.org/10.1016/0377-2217\(87\)90036-1](https://doi.org/10.1016/0377-2217(87)90036-1)
- Ulrich, W (2005). A brief introduction to critical systems heuristics (CSH). *ECOSENSUS project website*, The Open University, Milton Keynes, UK, 14 October 2005 http://projects.kmi.open.ac.uk/ecosensus/publications/ulrich_csh_intro.pdf
- Ulrich, W., & Reynolds, M. (2010). Critical Systems Heuristics. In *Systems Approaches to Managing Change: A Practical Guide*. Springer. Retrieved from http://link.springer.com/chapter/10.1007/978-1-84882-809-4_6
- Upward, A., & Jones, P. (2015). An Ontology for Strongly Sustainable Business Models: Defining an Enterprise Framework Compatible With Natural and Social Science. *Organization & Environment*. <https://doi.org/10.1177/1086026615592933>

Soft Systems Methodology: Recommended Readings

To support the exploration of SSM in assignment 2, consider the following sources. It is best to focus on Checkland’s work, because SSM has been frequently misunderstood and misapplied.

- Checkland, P., & Poulter, J. (2010). Soft Systems Methodology. In *Systems Approaches to Managing Change: A Practical Guide* (pp. 191–242). Springer, London. https://doi.org/10.1007/978-1-84882-809-4_5
This chapter is very similar to the book Learning for Action, but unlike the book, it’s openly available. A condensed account of mature SSM.

Checkland, P., & Scholes, J. (1990). *Soft systems methodology in action*. Chichester, West Sussex, England: Wiley.
This book presents detailed case studies of the application of SSM and reflects on how SSM evolved through its application. The cases are very useful for understanding SSM!

Checkland, P., & Holwell, S. (1998). *Information, systems and information systems : making sense of the field*. New York: Wiley.
This book uses soft systems thinking as a lens to structure the field of Information Systems (and design, really). It is still profoundly relevant in its focus on technological systems designed to support purposeful social action.

Checkland, P. (1981). *Systems thinking, systems practice*. New York: J. Wiley.

Checkland, P. (1999). *Systems Thinking, Systems Practice: Includes a 30-Year Retrospective*. Wiley.

Checkland, P. (2000). Soft systems methodology: a thirty year retrospective. *Systems Research and Behavioral Science*, 17, S11–S58.
The initial 1981 book was reprinted in 1999 including the 30-year retrospective. Those two components are also available separately.

Jackson, M. C. (1982). The nature of soft systems thinking: The work of Churchman, Ackoff and Checkland. *Journal of Applied Systems Analysis*, 9(1), 17–29.
This critique by Jackson of the work of soft systems thinking was one of the milestone papers in the shift from soft to critical systems thinking. It triggered a very interesting debate (Checkland and Ackoff both responded).

Critical Systems Thinking (CST): Recommended readings

The required by Ulrich (in week 5) is a short overview of key foundational ideas and outlines the theoretical and philosophical underpinnings of Critical Systems Heuristics (CSH), one of several approaches and contributions in the field of CST. I include a separate annotated short set of references for CST for two reasons: (1) to help you get started for assignment 2 if you are inclined toward the CST option; (2) to provide further reading suggestions for those interested.

Flood, R. L., & Jackson, M. C. (1991). *Critical systems thinking: directed readings*. Chichester; New York: J. Wiley. [UTL]
This reader is a brilliant collection of the papers that established CST as an independent school of thought clearly distinct from SSM. Several of the chapters are available separately online. The excellent commentary sections are available as scan on Quercus.

Flood, R. L., & Romm, N. (1996). *Critical systems thinking: current research and practice*. New York: Plenum Press. [UTL [book](#), [ebook](#)]
This edited volume contains some very interesting chapters, including the one below.

Midgley, G. (1996). What Is This Thing Called CST? In *Critical Systems Thinking: current research and practice* (pp. 11–24). Springer, Boston, MA. https://doi.org/10.1007/978-0-585-34651-9_1
A good but short summary of CST.

- Ulrich, W., & Reynolds, M. (2010). Critical Systems Heuristics. In *Systems Approaches to Managing Change: A Practical Guide*. Springer. Retrieved from http://dx.doi.org.myaccess.library.utoronto.ca/10.1007/978-1-84882-809-4_6
A comprehensive account of CSH illustrated in practice, including (importantly) its different modes of application. (Personally, however, I find that Ulrich's examples in the chapters of his 1983 book are the most compelling illustrations of the conceptual coherence of CSH.)
- Ulrich has published extensively on many aspects of his practical philosophy and critical systems practice. The following selection provides a good range of perspectives on CSH: a very short introduction, an analytic application, a systems design perspective, the research program, the role of CSH in civil society.*
- Ulrich, W. (2005). *A brief introduction to critical systems heuristics (CSH)*. ECOSENSUS Project Site, The Open University. Retrieved from http://projects.kmi.open.ac.uk/ecosensus/publications/ulrich_csh_intro.pdf
- Ulrich, W. (1981). A critique of pure cybernetic reason: The Chilean experience with cybernetics. *Journal of Applied Systems Analysis*, 8(1), 33–59. (see Quercus)
- Ulrich, W. (1987). Critical heuristics of social systems design. *European Journal of Operational Research*, 31(3), 276–283. [https://doi.org/10.1016/0377-2217\(87\)90036-1](https://doi.org/10.1016/0377-2217(87)90036-1)
This article discusses in detail and clarity the idea of boundary judgments as places where justification of rationality breaks off. It provides an introduction to the idea of those boundary judgments that isn't found in the other articles, and so can provide a strong introduction to this key concept. It also summarizes Ulrich's view on "the problem of practical reason" and what he means by "rationality".
- Ulrich, W. (1988). Systems thinking, systems practice, and practical philosophy: A program of research. *Systems Practice*, 1(2), 137–163. <https://doi.org/10.1007/BF01059855>
This article builds on the above by exploring the relationship between the rationality of instrumental (especially "hard") systems methods in contrast to a broader critical conception of socially rational decision making, drawing on Habermas' theory of communicative competence. Grounded in practical philosophy and clear in conception, it provides a strong motivation and background for CSH. It complements and motivates CSH accounts, because it refers to CSH but only shortly as an example.
- Ulrich, W. (2000). Reflective Practice in the Civil Society: The contribution of critically systemic thinking. *Reflective Practice*, 1(2), 247–268. <https://doi.org/10.1080/713693151>
- Ulrich, W., & Reynolds, M. (2010). Critical Systems Heuristics. In *Systems Approaches to Managing Change: A Practical Guide*. Springer. http://dx.doi.org.myaccess.library.utoronto.ca/10.1007/978-1-84882-809-4_6
This is a comprehensive account of CSH illustrated in practice, including (importantly) its different modes of application.
- Ulrich, W. (1983). *Critical Heuristics of Social Planning : A New Approach to Practical Philosophy*. Bern: P. Haupt. [UTL]
This book fully develops CSH. It goes far beyond the articles listed in its philosophical grounding and an in-depth discussion of rationality, discourse, Habermas, and Kant.
- Midgley took the frameworks of Ulrich and others further with a focus on Social Work.*
- Midgley, G., Munlo, I., & Brown, M. (1998). The Theory and Practice of Boundary Critique: Developing Housing Services for Older People. *The Journal of the Operational Research Society*, 49(5), 467–478. <https://doi.org/10.2307/3009885>

- Midgley, Gerald. (1992). The sacred and profane in critical systems thinking. *Systems Practice*, 5(1), 5–16.
- Midgley, Gerald. (1997). Dealing with coercion: critical systems heuristics and beyond. *Systems Practice*, 10(1), 37–57.
- Midgley, Gerald. (2000). Systemic intervention. In *Systemic Intervention* (pp. 113–133). Springer.

Evaluation

The main assignment is a case study conducted in teams of 3-4 in which you analyze a problem situation and propose an intervention. Refer to the separate assignment document for details.

Assignment	Weight	Due
A1: A causal loop diagram with a <1000-word discussion, submitted as PDF report	25%	March 17
A2: Case study presentation and discussion (team). Post visual materials by the start of class.	40% (team)	Week 6 (in class)
A3: Three appreciation diaries, posted a day before class in week 3 and 5, and after class at the end of week 6	10% 10% 15%	March 10 March 24 April 6

Where no time is given, assignments are due at the end of the day, 11:59pm.

Assignment 1: System dynamics

Develop and discuss a causal loop diagram that represents key interactions of a chosen system within the theme of *ICT design for Sustainable Cities*. The diagram should address the question defined in the assignment document. You can derive this diagram in whole or part from literature. Include a ‘behavior over time’ chart. Discuss applicable archetypes and loops. Identify 2 *Leverage Points* for change worth considering. Be prepared to talk others through the diagram in class. You will need to do some background research, but there is no expectation that you research the system exhaustively. For details, refer to the assignment document.

Assignment 2: A case study

In week 6, teams of 4 will present a case study in which they explore a problem situation using one systems thinking framework. The teams will need to do some background research to find information about their problem situation. Through the presentations of the teams, we will explore three distinct systems thinking approaches. Each presentation will address one systems thinking perspective. The assignment document defines the problem situation to address.

1. How would a **system dynamics** team approach the problem situation? Discuss a systems dynamics model and leverage points for technology-based interventions.
2. How would practitioners of **soft systems methodology** approach this problem situation? How could the process look? What kind of outcomes could it lead to? Discuss and illustrate your discussion as appropriate.
3. How would a **critical systems** practitioner approach this problem situation? What kind of framework could they employ, and what kind of outcomes could it lead to?

Assignment 3: Individual learning reflections

Each student is expected to post three blog posts reflecting their individual learning progress. Through these posts, aim to reflect on new systems ideas and your progress in gaining an appreciation of the diversity of systems thinking theories, methods, and practices. There is a dedicated shared class blog on Quercus where you should post either the text or, if you prefer to blog publicly, a link to a blog post on a different site. The writing style can be relatively informal, and each post should be about 500 words (definitely try to keep it below 1000). Include 2-3 references in a consistent citation style.

Schedule

	Focus	Readings, Lecture, Activities	Outcomes
1	Systems Thinking	<p>Read the syllabus!</p> <p>Lecture topics</p> <ul style="list-style-type: none"> - Systems thinking: concepts; history; parts, wholes, emergence, boundaries - System dynamics as one stream of a rich history of ways of systems thinking - Sustainability of what? - Technology and systems design for sustainability - Course overview and expectations 	<p>Shared understanding of course scope, goals, concepts, mode and expectations.</p> <p>Key ideas about systems and technology design.</p> <p>Class community and groups</p>
2	System Dynamics	<p>Read Meadows ch.1&2</p> <p>Lecture topics</p> <ul style="list-style-type: none"> - Key concepts of system dynamics - Causal loop diagrams - Archetypes and behaviors 	<p>The ability to draw and discuss causal loop diagrams. How structure causes behavior, and the role of mental models.</p>
3	The role of ICT in sustainability	<p>Read: Sterman ch. 4, and pages 177-191; review Sidewalk Toronto documents, esp. Vision sections</p> <p>Lecture topics</p> <ul style="list-style-type: none"> - How to think about sustainability? - The role of ICT in Sustainable Development - Ethics & psychology of intergenerational trade-off choices in technology design 	<p>Ways of thinking about the role of technologies and different aspects of sustainability</p>
4	Interventions and leverage points	<p>Read Meadows' Leverage Points; Ostrom</p> <p>Read (in less depth) Börjesson Rivera</p> <p>Lecture topics</p> <ul style="list-style-type: none"> - Tragedy of the Commons - Rebound effects (Jevon's paradox) - Leverage points <p>Discuss causal loop diagrams in teams</p>	<p>Explain counter-intuitive systemic effects such as rebound effects. Discuss leverage points in complex systems</p>
5	Observers, worldviews, wicked problems, critical perspectives	<p>Read all of: Rittel & Weber; Checkland & Poulter 2010; Ulrich 1987 (<i>Best read in this order. Plan some time for it!</i>)</p> <p>Lecture topics</p> <ul style="list-style-type: none"> - Observers, worldviews, boundary judgments - Soft Systems Methodology - Critical Systems Thinking 	<p>Appreciate positivist & constructivist perspectives on mental models. Characterize wicked problems.</p>
6	Projects & reflections.	<p>Read Karlskrona Manifesto.</p> <p>Present and discuss group projects</p> <p>Re-cap and outlook</p> <p>Discussion</p> <ul style="list-style-type: none"> - The roles and responsibilities of information professionals 	<p>Use systems thinking to articulate, critique and design systems and identify modes of constructive engagement.</p>

Guidelines for Assignments

All written assignments for this course must be submitted through Quercus. All assignments should be written as clearly and cleanly as possible (i.e. watch the typos, grammar, hanging sentences, etc.), in a formal but accessible academic language. The “look and feel” should be professional.

The required format for assignments is as follows:

- Single space, 12 point font, 1” margins, page numbers in the upper or lower right hand corner.
- Align paragraphs in a standard way and avoid superfluous indentation.
- No cover page required, but be sure to include your names & student numbers on page 1.
- Total word count must be indicated at the end of the essay.
- Use of footnotes/endnotes is permitted.

Assignments that do not meet a minimum standard (in terms of legibility, formatting, and proofreading) will be returned for re-submission, with late penalties in full effect.

Images

Students can include copyrighted images in their assignments as long as they follow the *Canadian Copyright Act's* current exceptions for fair dealing, in that the images must only be used for the purposes of criticism or review, and each image must be accompanied by: (a) the source; **and** (b) the name of the author(s) (if given in the source).

Acceptable Secondary Sources

As graduate students, you will be expected to use a majority of academic (i.e. peer reviewed) sources when writing your term paper. Students are very much allowed, but not at all limited, to use course readings and other sources referenced in lectures in their own papers. Additional sources and relevant journals that are recommended by the instructor are also acceptable. However, students are strongly encouraged to track down those resources that are best suited to their specific area of interest or inquiry, rather than rely too heavily on those provided in class.

For cutting edge information, news, announcements, etc., popular press articles are of course acceptable. But these should be used to supplement or update rather than replace peer reviewed sources, and should **never** be used to explain a theoretical concept. They should also come from credible, verifiable sources, who have the credentials (whatever these may be) to back up their claims. Often these articles point to underlying scholarly articles in peer reviewed journals or conferences, students are encouraged to pursue.

Late Papers

Unless a formal extension has been negotiated with the instructor in advance of the due date, late assignments (defined here as an assignment submitted *after* the deadline) will be penalized by one full letter grade per week (e.g. from A to A-), for a maximum of two weeks. After that point, late assignments will no longer be accepted. Furthermore, late papers will not receive detailed feedback or comments.

Extensions

Extensions on assignments within the term must be negotiated in advance, and require supporting documentation (e.g. doctor's note). Students must email requests for extensions to the instructor at least 24 hours prior to the due date. Exceptions will only be made in extenuating circumstances. Extensions beyond the end of the term in which a course is taken are subject to the [guidelines established by the School of Graduate Studies](#).

Grading

Grading for this course will follow the iSchool's official *Guidelines to Grade Interpretation* of letter grades, as well as the University's policy on *Graduate Grading and Evaluation Practices*. These sources define grades in the A range as “excellent” and grades in the B range as “good.” Please refer to the

guidelines for detailed descriptions of these categories. Assignments will be graded and returned within 2-3 weeks of submission.

Ground Rules

Each student in this course is responsible for keeping up with the course materials, which includes (all) the required course readings, as well as topics, debates, and concepts discussed in class. Students are expected to attend lectures and to take their own lecture notes. You are expected to participate in class discussions, and are encouraged to use your laptops/mobile devices during class to look up relevant information that will contribute to the discussion in a *meaningful way*. At all times, however, remember to be respectful of the instructor and of your classmates – turn your phone function off, turn off the sound on your computer, and be sure not to browse any websites that may be offensive or illegal, or that might be deemed irrelevant to the task of taking this course. Students should arrive on time and are expected to stay for the duration. If you miss a class, you are responsible for obtaining any information or materials given in class, either from your classmates or online. Unauthorized recording of the lectures is not permitted.

Students with a Disability or Health Consideration

Students with diverse learning styles and needs are welcome in this course. If you have a disability or health consideration that may require accommodations, please feel free to approach the instructor and/or the Accessibility Services Office (<http://www.accessibility.utoronto.ca/>) as soon as possible. The Accessibility Services staff is available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner arrangements are made, the quicker we can assist you.

Writing Support

The SGS Office of English Language and Writing Support provides free writing support to graduate students. Services are designed for both native and non-native speakers of English, and include non-credit courses, single-session workshops, individual writing consultations, and online resources. Students are encouraged to use these services as needed.

Academic Integrity

The iSchool has a **strict zero-tolerance policy** on plagiarism, as defined in section B.I.1. (d) of the University's *Code of Behavior on Academic Matters*. Before you embark on your first writing assignment, please make sure that you:

- Consult the University's site on Academic Integrity: <http://www.utoronto.ca/academicintegrity/>
- Acquaint yourself with the *Code* and Appendix "A" Section 2; <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>
- Review the material you covered in Cite it Right;
- Consult the site *How Not to Plagiarize*: <http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize>

Statement of Acknowledgement of Traditional Land.

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.