UNIVERSITY OF TORONTO • FACULTY OF INFORMATION

INF 1341H • Winter 2022

Systems Analysis & Process Innovation

Instructor:	**Prof. Eric Yu**
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Lectures:	**Tuesdays, 1-4 pm. Room BL116**
Office hours:	TBA

Syllabus

COURSE DESCRIPTION

There are numerous ways in which information technology can be used in any particular setting, with very different results. IT can be used to reduce costs and improve efficiency simply by taking advantage of the power of automation. But the increasingly diverse capabilities of IT systems can also stimulate innovative rethinking of business processes, reorganizing and simplifying work relationships and roles. Even more radically, strategic use of IT can lead to transformations in entire industries, changing the rules and business models within which customers, suppliers, partners and other stakeholders operate.

In the information systems world, the systems analyst acts as the intermediary between technical system developers on the one hand, and business managers and users on the other. Techniques have been developed to enable them to analyze business situations and communicate requirements to technical developers. With the rapidly changing role of IT in today's organizations, there is also need to rethink the methods and techniques used in systems analysis. This course will cover conventional systems analysis methods as well as recent developments. Modeling approaches considered will include process modeling, data modeling, object modeling, strategic modeling, and value network modeling. Strengths and limitations of various techniques will be examined.

COURSE OBJECTIVES

The course aims to provide an understanding of the concepts and practices of systems analysis. Emphasis is placed on the evolving context of systems analysis, ranging from automating existing processes, to innovative redesign of processes, to radical transformation. Modeling techniques used to support analysis in these diverse contexts are explored.

Student Learning Outcomes

At the end of this course, students will be able to:

- describe and explain the activities and contexts of systems analysis (Assignments 1, 2, 3)

- describe the changing nature of systems analysis, where information systems can be used to achieve varying degrees of change to existing processes (Assignments 1, 2, 3)
- approach an organization to study its activities and processes from the perspective of systems analysis. (Assignments 1, 2)
- map processes using modeling techniques for analysis (Assignments 1, 2)
- analyze the processes and data in an organization, and to explore alternative options for redesigning or improving processes, taking advantage of information technology systems. (Assignment 2)
- use modeling techniques to explore more fundamental changes, including those involving reconfigurations of relationships among stakeholders inside and outside the organization. (Assignments 2, 3)
- discuss the strengths and limitations of various techniques for systems analysis (Assignments 2, 3).

Relationship to Master of Information (MI) Program-Level Student Learning Outcomes

This course exposes students to a wide range of concepts and techniques for analyzing information systems in organizational contexts. Knowledge of systems analysis is fundamental for many information professionals (Outcome 1). Through a practical project, students develop knowledge and values that will prepare them for future professional practice, recognizing a multiplicity of needs arising from diverse organizational context and individuals of many kinds of backgrounds (Outcome 2). With an understanding of the historical development and evolution of a series of techniques, students are equipped to learn and critique new techniques that they may encounter in their future careers (Outcome 6). https://ischool.utoronto.ca/areas-of-study/master-of-information/

COURSE SCHEDULE

Notes. Readings are to be done before each class. Changes to this schedule will likely be made, with appropriate notice given. Additional readings may be assigned. Lecture slides will be posted on Quercus.

Week 1	**Jan 11**	**Systems Analysis and Organizational Change**
	Contents	1,2. Systems analysis in today's world. Business processes. Course overview. 3. Tutorial exercise:: Business Processes.
	Readings	▪ **DLMR** Ch 1 pp. 1-7, 16-27. Business processes.
	Supplementary Readings	▪ **KK** Ch 1, 2 (or **WB** Ch 1, 2, 3, 5). Context for systems analysis. ▪ Chui, W., Manyika, J., et al. Ten IT-enabled Business Trends for the Decade Ahead. McKinsey Global Institute, 2013.

Week 2	**Jan 18**	**Modeling and Analyzing Processes – BPMN; Process Discovery, Requirements Discovery**
	Contents	1. Systems analysis in the Context of System Development; Approaches to process modeling and analysis. 2. Tutorial exercise: BPMN. 3. Information gathering techniques and requirements discovery. 4. Professional ethics in systems analysis and research ethics for the course assignments.
	Readings	**DLMR** Ch 2 pp. 35-45. Process identification, process architecture. **DLMR** Ch 5 pp. 159-194. Process discovery.
	Supplementary Readings	▪ **KK** Ch 4, 5 (or **SJB** Ch 2 or **WB** Ch 6). Requirements discovery. ▪ **BPMN** 2.0 Poster ▪ http://www.bpmn.org/

	▪ Silver, Bruce. BPMN Method and Style: A levels-based methodology for BPM process modeling and improvement using BPMN 2.0. Cody-Cassidy Press. 2nd Edition, 2011. [Check availability] 650.0113 S587B2 (STL). ▪ BPMN Quick Guide

Week 3	**Jan 25**	**Process Automation, Innovation, Transformation; Modeling and Analyzing Processes – UML Activity Diagrams**
	Contents	1. Varying degrees of process change – automation, innovation, transformation. 2. Tutorial: Assignment 1 discussion. 3. BP redesign, heuristics, reference models. 4. UML Activity Diagrams.
	Readings	▪ Hammer, M. Reengineering Work - Don't Automate, Obliterate. Harvard Business Review, 68(4), July-August 1990. pp. 104-112. ▪ **DLMR** Ch 3 pp. 75-108. Essential process modeling (BPMN). ▪ **DLMR** Ch 8 pp. 297-325. Process redesign heuristics; Appendix A (skim). ▪ **DLMR** Ch2 pp. 45-47. Reference models
	Supplementary Readings	▪ Davidson, W.H. Beyond re-engineering: The three phases of business transformation. IBM Systems Journal 38(3/4), 1999, pp. 485-499. ▪ **KK** Ch 10 (or **WB** Ch 10). UML Activity Diagrams section. ▪ Industry-specific reference models (e.g., SCOR, eTOM, ACORD) ▪ **DLMR** Ch 6, 7. Process analysis – qualitative and quantitative (skim). ▪ Accenture. Leaders Wanted: Experts at Change at a Moment of Truth. Executive Summary. Accenture Technology Vision 2021. 30pp.

Assignment 1 due Thursday, Jan. 27.

Week 4	**Feb 1**	**Modeling and Analyzing Processes – DFDs**
	Contents	1. System development methods. 2. Tutorial exercise: DFD. 3. Data flow modeling.
	Readings	▪ **KK** Ch 7 (or **WB** Ch 9). Process modeling - DFDs.
	Supplementary Readings	▪ Yourdon, E. Just Enough Structured Analysis. 2006. (Updated, condensed version of: Yourdon, E. Modern Structured Analysis, Yourdon Press, 1989. [Check availability] 004.21 Y81M (STL)). ▪ **KK** Ch 9. Process specification & structured decision analysis ▪ **KK** Ch 8. Data dictionary ▪ IDEF0 Method Report. (Skim). Registration required. ▪ Lewis, Mark, Brett Young, Lars Mathiassen, Arun Rai, and Richard Welke. Business process innovation based on stakeholder perceptions. *Information, Knowledge, Systems Management* 6(1), 2007, pp. 7-27. ▪ Vom Brocke, J., & Mendling, J. Business process management cases. Digital Innovation and Business Transformation in Practice. Berlin et al.: Springer. 2018.

Week 5	**Feb 8**	**Modeling and Analyzing Data – ER/UML Class Diagrams**
	Contents	1. Project assignments (A2 Q&A). 2. Tutorial exercise: ERD. 3. Entity-Relationships Diagrams; UML Class Diagrams.
	Readings	▪ **KK** Ch 2 42-45, Ch 10 269-271, 275-280 (or **SJB** Ch 4 or Hoffer Ch 4 or **WB** Ch 8, 10).
	Supplementary Readings	▪

Week 6	**Feb 15**	**Data Modeling (Cont'd); Feasibility Analysis**
	Contents	1. Data modeling. 2. Tutorial: Assignment 2 discussions.

	3. Feasibility analysis.
Readings	▪ **KK** Ch 3 (or **WB** Ch 11). Feasibility Analysis section.
Supplementary Readings	▪

Reading week: Feb 22-25. NO CLASS.
Assignment 2 due: Monday, Feb 28.

Week 7 Mar 1 Modeling and Analyzing Value Exchanges and Strategic Interests

Contents	1. Value Network Analysis (VNA); Business transformation. 2. i* strategic actor relationships modeling. 3. Tutorial exercise: i* SD.
Readings	▪ Allee, V. A value network approach for modeling and measuring intangibles. White paper presented at the Transparent Enterprise Conference, Madrid, 2002. ▪ Yu, E. Social Modeling and i*. In: Conceptual Modeling: Foundations and Applications - Essays in Honor of John Mylopoulos. A. T. Borgida, V. Chaudhri, P. Giorgini, E. S. Yu (Eds). LNCS volume 5600. Springer, 2009. pp. 99-121. ▪ Yu, E. Towards Modelling and Reasoning Support for Early-Phase Requirements Engineering. Proc. 3rd *IEEE Int. Symp. on Requirements Engineering (RE'97)*, Washington D.C., USA. 1997. pp. 226-235. ▪ Yu, E. and Mylopoulos, J., Towards Modelling Strategic Actor Relationships for Information Systems Development - With Examples from Business Process Reengineering, *Proc. 4th Workshop on Information Technologies and Systems*, 1994.
Supplementary Readings	▪ Allee, Verna. Reconfiguring the Value Network. *Journal of Business Strategy* 21(2), Jul/Aug 2000, pp. 36-39. ▪ Allee, V. Value Network Analysis and value conversion of tangible and intangible assets. *Journal of Intellectual Capital*. 9(1), 2008, pp. 5-24.

Week 8 Mar 8 Modeling and Analyzing Strategic Interests

Contents	1. Stakeholder analysis; i* strategic actor relationships modeling. 2. Goal modeling. 3. Tutorial exercise: i* SR; goal modeling.
Readings	▪ Yu, E. and Mylopoulos, J., Understanding Why in Software Process Modelling, Analysis, and Design. *Proc. 16th Int. Conf. Soft. Eng.*, (ICSE'94), 1994, pp. 159-168.
Supplementary Readings	▪ F. Dalpiaz, X. Franch, J. Horkoff. iStar 2.0 Language Guide. 2016. ▪ An, Y., Dalrymple, P. W., Rogers, M., Gerrity, P., Horkoff, J., & Yu, E. Collaborative social modeling for designing a patient wellness tracking system in a nurse-managed health care center. Proc. *4th Int'l Conf. on Design Science Research in Information Systems and Technology*, ACM, 2009, p.2. ▪ Yu, E. Models for Supporting the Redesign of Organizational Work. *Proc. Conf. on Organizational Computing, (COOCS'95)*, 1995, pp. 225-236. ▪ Yu, E. and Mylopoulos, J., An Actor Dependency Model of Organizational Work, *Proc. Conf. on Organizational Computing, (COOCS'93)*, 1993, pp. 258-268. ▪ Alexander, I. and Robertson, S. Understanding Project Sociology by Modeling Stakeholders. *IEEE Software* 21(1), 2004, pp. 23-27.

Week 9	Mar 15	Business Model Innovation; Studio presentations
	Contents	1. E-business, business model innovation. 2. Studio Presentations. 3. Studio Presentation feedback. Business modeling.
	Readings	▪ Chesbrough, H. Business model innovation: it's not just about technology anymore. Strategy & Leadership, 35(6), 2007, pp. 12-17. ▪ Johnson, M. W., Christensen, C. M., & Kagermann, H. Reinventing your business model. *Harvard business review*, 86(12), 2008, pp. 57-68. ▪ From Osterwalder, A. and Pigneur, Y. Business Model Generation, Wiley, 2010: ▪ Canvas – your business model on one page. ▪ Book excerpt (72 p).
	Supplementary Readings	▪ Teece, D. J. Business models, business strategy and innovation. *Long range planning*, 43(2), 2010, pp. 172-194. ▪ Osterwalder, A., Pigneur, Y. (2010) Business Model Generation: A Handbook For Visionaries, Game Changers, And Challengers. Wiley. 288pp. 658.4012 O85B (STL) [Check availability].

Week 10	Mar 22	Requirements Definition; Object-Oriented Analysis; Studio presentations
	Contents	1. Business goal and system requirements. Requirements management. Functional and non-functional requirements. Early vs. late requirements engineering activities. 2. Studio Presentations. 3. Object-Oriented Modeling and Analysis; Use cases.
	Readings	▪ ISO/IEC/IEEE 29148:2011. Systems and software engineering -- Life cycle processes -- Requirements engineering. ▪ Volere - Requirements Resources. ▪ **KK** Ch 10 (or **WB** Ch 11 or **SJB** Ch 3). Object-Oriented Modeling and Analysis; Use Cases.
	Supplementary Readings	▪ IEEE Standard 830-1998. Recommended practice for software requirements specifications. (Superseded by ISO/IEC/IEEE 29148:2011). ▪ Wiegers, K.E., and J.Beatty. Software requirements, 3rd ed. Microsoft Press, 2013. [Check availability] 005.1 W645S3 (STL).

Week 11	Mar 29	Systems Development and Knowledge Management; Enterprise Architecture; Studio presentations
	Contents	1. System Development Principles - methods, models, tools. Knowledge management. 2. Studio Presentations 3. IT/IS disciplines and skills. Enterprise architecture.
	Readings	▪ Beck, K., Boehm, B. Agility Through Discipline: A Debate. *IEEE Computer*, 36(6) June 2003. pp. 44-46.
	Supplementary Readings	▪ **KK** Ch 6. Agile modeling

Week 12	Apr 5	Final project presentations
	Contents	Final project presentations.
	Readings	▪ N/A

Supplementary Readings	▪ N/A.

Assignment 3 Due: Friday, Apr 8.

COURSE REQUIREMENTS

Class attendance and participation are mandatory. The main course work is a project that runs through the course. Assignment 1 is an initial exploration of an organizational setting that you have chosen to study. In Assignment 2, you will use process and data modeling to analyze and propose information systems solutions that respond to problems and opportunities mainly from the "process automation" and "process innovation" perspectives. In Assignment 3, you will focus on the "transformation" perspective. Strategic modeling and goal modeling will be used. Throughout the course, you will be expected to contribute on Quercus to share notes and insights, experiences from your individual work and collaborative work with team members, and from class discussions and presentations from other teams. Each team will prepare two presentations. The marking scheme is as follows:

Assignment	Value
Assignment 1: Initial exploratory study; process modeling (Individual work)	20%
Assignment 2: (Team work) Process automation & innovation; process & data modeling	30%
Assignment 3: (Team work) Exploring transformations; strategic modeling & goal modeling	28%
Project "Studio" Presentation (Team)	0%
Project Final Presentation (Team)	8%
In-class exercises (Individual)	6%
Participation, in-class and online (Individual)	8%
Total	*100%*

Software tools

Students are expected to use software tools such as Microsoft Visio, Lucidchart, Diagrams.net, or Signavio to construct models. You may request access to Visio here. Provide your utorid in the "Issue Description" box.

Teamwork

Each team report should contain a brief description of the division of responsibilities among team members. Each team is responsible for ensuring equitable division of work and of learning opportunities amongst its members. Each team member will be asked about the contributions of other team members. If a team member drops the course, he/she should immediately notify his/her fellow team member(s) and the instructor, so that a new team can be reconfigured. Here is a quick guide to effective group work.

Project Presentations

A systems analyst will typically have to present (and defend) his/her findings and recommendations many times during a real-life project. The in-class presentations in this course provide opportunities to share and discuss

experiences across teams. Each team will prepare two presentations. The "Studio" presentation presents work-in-progress. It is an occasion to obtain input from the class on your intermediate results. Since the Studio Presentations are spread out over a number of weeks, teams will be asked to emphasize topics covered recently in the course. In the Final Presentation, teams present the project findings and conclusions to the class. The class is expected to provide critical and constructive feedback to each presentation.

RESOURCES

Recommended Texts

Dumas, Marlon, Marcello La Rosa, Jan Mendling, and Hajo A. Reijers. *Fundamentals of business process management*. Heidelberg: Springer (2018). ISBN: 978-3-662-56509-4 (Online) https://doi.org/10.1007/978-3-662-56509-4
(Referred to as **DLMR** in the course schedule.).

Kendall, K. E. and Kendall, J.E. *Systems Analysis and Design.* 9th ed. Pearson Prentice Hall, 2014. [Check availability] 004.21 K33S9 (STL). (Referred to as **KK** in the course schedule.). Or 10th ed. 2020.

Readings

Indicated on schedule for each week.

ADDITIONAL RESOURCES

Supplementary Texts

Satzinger, J., Jackson, R., Burn S. *Systems Analysis and Design in a Changing World*, 7th ed. (2016) ISBN-10: 1305117204. Thomson Course Technology. 6th ed., 2012. ISBN: 9781111972264. [check availability] 004.21 S254S6 (STL) – see also [Check availability] 004.2 S253I6 (STL) (Referred to as **SJB** in the course schedule.)

Hoffer, J. A., George, J. F. and Valacich, J. S. *Modern Systems Analysis and Design.* 7th ed., Pearson Prentice Hall, 2014. [Check availability] 005.12 H698M7 (STL)

Whitten, J. L., Bentley, L. D. *Systems Analysis and Design Methods*,7th edition, Irwin McGraw-Hill (2007) ISBN 0073052337 [Check availability] 005.1 W624S7 (STL, 2 copies), and *6*th Edition, (2004) [Check availability] 005.1 .W624S6 (Referred to as **WB** in the course schedule.).

Further Readings

Weske, Mathias. Business Process Management: Concepts, Languages, Architectures, 2nd Ed., Springer, 2012.

vom Brocke, Jan & Michael Rosemann (Eds.) Handbook on Business Process Management 1: Introduction, Methods, and Information Systems, 2nd Ed., Springer, 2015.

Wohed, Petia, Wil MP van der Aalst, Marlon Dumas, Arthur HM ter Hofstede, and Nick Russell. On the suitability of BPMN for business process modelling. Business Process Management, 4th Int. Conf., LNCS Vol. 4102, 2006, pp 161-176 . Springer, 2006.

Paul Harmon (2007). Business Process Change: A Guide for Business Managers and BPM and Six Sigma Professionals. Amsterdam: Elsevier. [e-book] http://go.utlib.ca/cat/7853701

Venkatraman, N. "IT-enabled business transformation: from automation to business scope redefinition." *Sloan management review* 35(2), (1994): 73-87.

International Institute of Business Analysis. IIBA Business Analysis Competency Model Version 3. 2012.

The *i** wiki http://istarwiki.org The *i** homepage. www.cs.toronto.edu/km/istar

Yu, Eric, Paolo Giorgini, Neil Maiden, John Mylopoulos. Social Modeling for Requirements Engineering. MIT Press. 2011.

Axel van Lamsweerde. Requirements Engineering in the Year 00: A Research Perspective. *22nd International Conference on Software Engineering (ICSE 2000)*, Limerick, ACM Press, 2000.

Zowghi, Didar and Chad Coulin (2005) Requirements Elicitation: A Survey of Techniques, Approaches, and Tools. In: Aurum, A., Wohlin, C. (eds.) Engineering and Managing Software Requirements, Part 1, Pages 19-46.

Hickey, Ann M., Alan M. Davis: Elicitation Technique Selection: How Do Experts Do It? *11th IEEE Int. Conference on Requirements Engineering (RE 2003)*, Monterey Bay, CA, USA. IEEE Computer Society 2003, 169-179.

Gartner Group.

Forrester Research Inc.

Grading

Please consult the iSchool's:

- Grade Interpretation Guidelines: https://ischool.utoronto.ca/wp-content/uploads/2016/11/grade-interpretation.pdf
- The University Assessment and Grading Practices Policy: http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/grading.pdf
- The Guidelines on the Use of INC, SDF, & WDR: http://www.sgs.utoronto.ca/facultyandstaff/Pages/INC-SDF-WDR.aspx

These documents will form the basis for grading in the course.

Late Policy

There will be a penalty of half a letter grade for every 24-hour period an assignment is submitted after the specified due date and time. For example, a B+ becomes a B+/B if submitted on the day after the due date, a B if submitted on the second day after the due date. Requests for extensions will only be considered for medical reasons with doctor's note. The request must be received before the due date.

Writing Support

As stated in the iSchool's Grade Interpretation Guidelines, "work that is not well written and grammatically correct will not generally be considered eligible for a grade in the A range, regardless of its quality in other respects." With this in mind, please make use of the writing support provided to graduate students by the SGS Graduate Centre for Academic Communication. The services are designed to target the needs of both native and non-native speakers and all programs are free. Please consult the current workshop schedule http://www.sgs.utoronto.ca/currentstudents/Pages/Current-Years-Courses.aspx for more information.

Academic integrity

Please consult the University's site on Academic Integrity http://academicintegrity.utoronto.ca/. The iSchool has a zero-tolerance policy on plagiarism as defined in section B.I.1.(d) of the University's Code of Behaviour on Academic Matters http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun011995.pdf. You should acquaint yourself with the Code. Please review the material in Cite it Right and if you require further clarification, consult the site How Not to Plagiarize http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize.

Cite it Right covers relevant parts of the U of T *Code of Behaviour on Academic Matters* (1995). It is expected that all iSchool students take the Cite it Right workshop and the online quiz. Completion of the online Cite it Right quiz should be made prior to the second week of classes. To review and complete the workshop, visit the orientation portion of the iSkills site: https://ischool.utoronto.ca/iskills/

Accommodations

Students with diverse learning styles and needs are welcome in this course. If you have a disability or a health consideration that may require accommodations, please feel free to approach me and/or the Accessibility Services Office http://www.studentlife.utoronto.ca/as as soon as possible. The Accessibility Services staff are available by appointment to assess needs, provide referrals and arrange appropriate accommodations. The sooner you let them and I know your needs, the quicker we can assist you in achieving your learning goals in this course.

Academic Dates: https://ischool.utoronto.ca/current-students/academic-resources/academic-calendar/

Statement of Acknowledgement of Traditional Land:

The following is the University approved land acknowledgment statement for official ceremonies (Ceremonial Committee, Governing Council):
See: http://www.provost.utoronto.ca/Assets/Provost+Digital+Assets/TRC_FinalReport.pdf

"I (we) would like 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."

See also, the Faculty of Information's Commitment to the Findings and Call for Action of the Truth and Reconciliation Commission (approved at the Feb. 4, 2016 Faculty Council): https://ischool.utoronto.ca/wp-content/uploads/2017/11/iSchools-TRC-Commitment.pdf

Information about iSchool Workshops:

The following workshop series are exclusively available to the iSchool community. iSchool professors, Inforum librarians, current students, alumni, and a collective of professionals and academics from each program and concentration, work together to create these unique rosters.

Together with the MMSt and MI curricula, these academic, professional, and technical iSkills workshops provide a robust information and heritage graduate educational experience.

iSkills Workshops: https://ischool.utoronto.ca/iskills/

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