Law and Technology in Legal Education: A Systemic Approach at Ryerson

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Abstract

The Faculty of Law at Ryerson University has undertaken extensive curricular reforms aimed at engaging with technology as a central requirement of legal practice. These reforms reflect an undertaking to develop practice-based education and an undertaking to teach students to think critically about the impact of automating and mechanizing legal information. Teaching students to identify how to use technology, how to design it, and how to challenge its effects are key to providing a systemic approach to law and technology. This is an approach that teaches students to identify how law and legal services can be fundamentally altered by computational analysis.

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THE NEW FACULTY OF LAW at Ryerson University has joined in the debate over what skills are necessary for legal practice and whether law schools should teach those skills.[1] While its focus on practice readiness may be notable, what is truly interesting about Ryerson's curriculum is the central role that technology plays in the formulation of practice readiness.[2] The curriculum includes mandatory courses in legal technologies, coding, innovation, and technological entrepreneurialism. Ryerson has taken on the responsibility of preparing its students to engage with technology as a central requirement of legal practice.

While practice readiness is the goal, this article provides insight into why Ryerson's approach is sensitive to the difference between learning to use technology and learning how to challenge its effects.[3] New technologies can deliver positive legal change, including enhanced accessibility, mobility, and knowledge. However, they can also unravel the norms, processes, and relationships at the heart of legal organization. This is especially cogent where individuals and entities are newly empowered or disempowered in relation to each other. As a result, teaching students to think critically about the production of law through technology requires some further thinking about how lawyers can become critical purveyors of the technology they and their clients will use.

This article addresses this pedagogic need by putting systemic thinking about technology at the centre of professional legal education. Learning from deep descriptions of how technology impacts law's formulation, a systemic approach identifies the ways that digitization and data management are implicated in

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1.   See Canadian Common Law Program Approval Committee, *Report on Application by Ryerson University for Approval of Proposed Law School Program* (Federation of Law Societies of Canada, 2017) online (pdf): <flsc.ca/wp-content/uploads/2017/12/Approval-Committee-Ryerson-Report-Dec-2017-C.pdf >; Professional Development & Competence Committee, *Ryerson University Proposed Integrated Practice Curriculum*, by Margaret Drent (Law Society of Ontario, 25 April 2019), online (pdf): <s3.amazonaws.com/tld-documents.llnassets. com/0011000/11880/convocation-april-2019-professionaldevelopmentandcompetencecom mitteereport.pdf >.

2.   See Daniel Bates, "Are Digital Natives Equipped to Conquer the Legal Landscape" (2013) 13 Legal Info Mgmt 172; Anne Binsfeld, "New Barristers' Information Literacy Challenges as they Transition from Education to the Workplace" (2019) 19 Legal Info Mgmt 36; Simon Canick, "Technology in Law School Curriculum" (2014) 42 Capital UL Rev 663 at 663, 665-68; Craig T Smith, "Technology and Legal Education: Negotiating the Shoals of Technocentrism, Technophobia, and Indifference" (2002) 1 J Assoc Leg Writing Directors 247 at 247-48.

3.   See Mireille Hildebrandt, "Law as Computation in the Era of Artificial Legal Intelligence: Speaking Law to the Power of Statistics" (2018) 68 UTLJ 12 at 14 [Hildebrandt, "Law"]; Paul Gowder, "Transformative Legal Technology and the Rule of Law" (2018) 68 UTLJ 82.

the organization of people in relation to law.[4] As explored below, a systemic approach attempts to achieve a goal more complex than teaching the use of emergent technologies or how to improve efficiencies through standardization and systemization.[5] Rather, it seeks to address questions about whether and how practitioners will be well-placed to address the tensions that technology will produce for law and legal practice. Once one comprehends that technology is used to produce law, then one sees that what is at stake is the role that lawyers play in understanding those technologies. Therefore, in addition to acquiring new skills, students should be expected to analyze how a given technology disrupts the role that lawyers play in the interpretation, application, and delivery of law.

The paper addresses these issues in two major parts. In Part I, I link the need for curricular reform to the recognition that technology has begun to disrupt the legal profession. I explain that what will be changed by emerging technologies is who will provide legal services to the public. However, my summary of curricular reforms highlights how little legal education has been able to incorporate this fundamental change into teaching.

In Part II, I outline the problem with this disconnect between legal practice and legal education as a gap in preparing lawyers for effective legal representation. In doing so, I explain the rationale for using a systemic approach in law school curricula as a way to transcend intransigence over teaching technology. I then propose a systemic pedagogy that incorporates technology into legal education as a tool, as a discourse, and as a social lens.[6] This pedagogy draws on two of Ryerson's teaching pillars (user-based learning and innovation-based learning) to illustrate its blended turn to technology as a facet of practice readiness.

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4.   Richard Susskind & Daniel Susskind, *The Future of the Professions: How Technology Will Transform the Work of Human Experts* (Oxford University Press, 2015).

5.   For thinking on the topic of systemic legal education, I am indebted to Harry Arthurs, Roderick Macdonald, Jason MacLean, and Rosalie Jukier. See Harry Arthurs, "Law and Learning in an Era of Globalization" (2009) 10 German LJ 629 [Arthurs, "Law"]; Harry Arthurs, "Madly Off in One Direction: McGill's New Integrated, Polyjural, Transsystemic Law Programme" (2005) 50 McGill LJ 707; Roderick A Macdonald & Jason MacLean "No Toilets in the Park" (2005) 50 McGill LJ 721; Rosalie Jukier, "Transnationalizing the Legal Curriculum: How to Teach What We Live" (2006) 56 J Leg Educ 172.

6.   In this I rely on the inclusive definition of technology as systems. See Val Dusek, *Philosophy of Technology: An Introduction* (Blackwell, 2005) at 26-37 (all systems in which physical hardware and rules are applied in ways that implicate the organization of people in relation to law).

I.   THE DISRUPTION OF LEGAL PRACTICE AND LEGAL EDUCATION

A.   THE DISRUPTION OF PRACTICE

The scholarship and commentary on technology and legal practice seems relatively consistent in its message that the practice of law is currently undergoing or is about to undergo a period of massive disruption as a result of technological innovation.[7] Legal commentators have borrowed the term "disruption" from economists to describe the development of technologies that contain the potential to make legal services much more affordable, and therefore accessible, to a greater number of people.[8] While it is unclear whether clients have benefited from a marked reduction in cost or accessibility, this section explains why it is clear that emerging technologies will alter who or what provides those legal services. This section outlines those changes in order to identify downstream pressures on the academy.

Much of the legal scholarship attributes the disruptive use of legal technology to the economic crisis of 2008 and the decline in demand for expensive legal services.[9] Economic changes in this period bolstered customer expectations for fixed fee arrangements, discounts, and technological efficiencies.[10] At the same time, global demands for more innovative, technologically savvy, and nimble approaches to managing interactions across jurisdictions and between sectors grew. The effect of these changes has been to pressure the legal profession to change how service is provided. As the Canadian Bar Association (CBA) warned,

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7.   See generally John O McGinnis & Russell G Pearce, "The Great Disruption: How Machine Intelligence will Transform the Role of Lawyers in the Delivery of Services" (2014) 82 Fordham L Rev 3041; Richard Susskind, *Tomorrow's Lawyers: An Introduction to Your Future* (Oxford University Press, 2013) [Susskin, *Tomorrow's Lawyers*]; Raymond H Brescia et al, "Embracing Disruption: How Technological Change in the Delivery of Legal Services Can Improve Access to Justice" (2014) 78 Alb L Rev 553 [Brescia et al, "Embracing Disruption"]; Clayton M Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms To Fail* (Harvard College, 1997); Jordan Furlong, "The Pivot Generation: How Tomorrow's Lawyers Will Help Build a New and Better Legal Market" (2017) 50 Suffolk UL Rev 415.

8.   See Clay Christensen, "Disruptive Innovation Explained" (6 March 2012), online (video): *Harvard Business Review* <hbr.org/2012/03/disruptive-innovation-explained>.

9.   For a discussion of disruption as a term in the legal context, see Brian Sheppard, "Incomplete Innovation and the Premature Disruption of Legal Services" (2015) Mich State L Rev 1797.

10.   Susskind, *Tomorrow's Lawyers*, *supra* note 7 at 3-5.

the "legal industry in Canada is not immune to the major macro trends that are transforming virtually every industry in the world."[11]

For the purposes of this discussion, disruptive legal technologies can be divided into two types: technologies that create efficiencies for professional lawyers and technologies that create efficiencies for non-professional users (*i.e.*, clients, government agencies, arbitrators, mediators, et cetera).

1.   EFFICIENCIES FOR LAWYERS

John O. McGinnis and Russell G. Pearce identified five key areas of legal practice in which machine intelligence will dramatically alter practice in the near future: "discovery, legal search, document generation, brief generation, and [case prediction]."[12] Several machine learning technologies developed in Canada, such as Blue J Legal and Clause Hound, typify this market.[13] These technologies offer predictive analysis backed by analytics, as well as plain language searching and automated document production.

Similar types of efficiencies in assembling and analyzing client data are expected to be achieved through machine learning for other undertakings. For instance, e-discovery provides automated analyses of large data sets needed for evidence in litigation and corporate matters. Blockchain uses systems that independently verify identities, ownership, registration, and legal existence in secured and commercial transactions, real estate transactions, and dispute resolution.

These technologies are differentiated from earlier technological changes by their reliance on machine learning to alter who (or what) provides the service to clients.[14] Analyses that might have taken years of experience and hours of human work to produce are now generated by software programs. Tasks previously undertaken by lawyers to transfer assets, ensure validity in a commercial transaction, or liaise with clearing agencies, depositories, registries, and regulators are now undertaken by programs that replace the trust or validation of a lawyer. Consequently, the ability to access legal knowledge is expected to increase and the costs of accessing it are expected to decrease.

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11.   Richard Susskind, *The Future of Legal Services in Canada: Trends and Issues* (Canadian Bar Association, June 2013) at 4.

12.   McGinnis & Pearce, *supra* note 7 at 3043.

13.   For an early comparison between these expert systems and AI, see Richard Susskind, "Expert Systems in Law: A Jurisprudential Approach to Artificial Intelligence and Legal Reasoning" (1986) 49 Mod L Rev 168 at 169.

14.   Sheppard, *supra* note 9.

The potential impacts of automation on professional practice are immense. For example, commentators have asked where responsibility lies when non-lawyers or lawyers use technology to provide legal services but do not possess the analytical tools required to assess its adequacy.[15] One answer is that these technologies will be blocked from the legal market where deemed to provide unlicensed legal advice, or their scope of use will be limited.[16] Others disagree and see their uptake continuing apace with few implications for liability. For example, McGinnis and Pearce argue that, while unauthorized practice statutes pose some barriers to machine intelligence, standards for professional ethics, market forces, and scope of uptake instead predict increased reliance on technology.[17] A third body of commentators has called for an entirely new model for assigning liability to the machines themselves.[18] Ultimately, these debates reveal that professional liability and responsibility resulting from technology will remain ambiguous in the near future.

Similarly, reliance on predictive programs is different in nature from the use of web-based repositories because such programs remove some of the labour previously needed to provide opinions about the law. This development is expected to disrupt both legal training and the distribution of income within the practice of law in the near future.[19] Labour normally carried out by junior lawyers and those who provide routine legal services could be replaced by technologies that write research memos, draft simple wills, manage house closings, and register

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15.   See Dana A Remus, "The Uncertain Promise of Predictive Coding" (2014) 99 Iowa L Rev 1691. For discussion of the issue in the United States, see Larry E Ribstein, "The Death of Big Law" (2010) Wis L Rev 749 at 807-808; Ray Worthy Campbell, "Rethinking Regulation and Innovation in the U.S. Legal Services Market" (2012) 9 NYU J L & Bus 1 at 45-51.

16.   See *e.g.* Gillian Hadfield, "Legal Barriers to Innovation: The Growing Economic Cost of Professional Control Over Corporate Legal Markets" (2008) 60 Stan L Rev 1689 at 1720-21, 1724-25.

17.   McGinnis & Pearce, *supra* note 7 at 3059-64.

18.   See *e.g.* Ignacio N Cofone, "Servers and Waiters: What Matters in the Law of AI" (2018) 21 Stan Tech L Rev 167; Dafni Lima, "Could AI Agents Be Held Criminally Liable: Artificial Intelligence and the Challenge of Criminal Law" (2018) 69 SCL Rev 677.

19.   See Jon M Garon, "Legal Education in Disruption: The Headwinds and Tailwinds of Technology" (2013) 45 Conn L Rev 1165; Jordan Furlong, "The Evolution of the Legal Services Market: Stage 3" (7 November 2012), online (blog): *LAW21* www.law21. ca/2012/11/the-evolution-of-the-legal-services-market-stage-3.

documents.[20] As a result, the structural use of junior lawyers within firms may change, as will the method for obtaining skills needed for mid-career practice.[21]

2.   EFFICIENCIES FOR NON-LAWYERS

In addition to technologies for lawyers, the quest for efficiencies has led to the introduction of automated systems in key fields where individual judgement is time and risk intensive. These technologies lower the cost of service. However, they also disrupt responsibility for decisions and raise more fundamental questions about how lawyers can effectively represent clients within these systems.[22]

For example, recent studies have documented the use of predictive analytics by legal professionals in assessing bail as well as assessing the risk of recidivism in pre-trial and sentencing decisions.[23] However, algorithms directed at bail decisions in the United States have been almost twice as likely to falsely label Black prisoners as being at high risk for re-offending than white prisoners.[24] Moreover, similar technologies are being used by non-lawyers to predict hot spots for increased surveillance and to promote intensive police presence.[25] Solon Barocas and Andrew Selbst explain how AI technologies like these allow powerful actors to make algorithmic decisions that have a disparate impact on subordinated groups.[26]

A recent study of Canada's immigration and refugee system shows automated decision processes are being used by regulatory decision-makers to classify immigration cases, triage applications, generate scores, produce factors to support reasoning, identify cases for investigation, and provide recommendations for or

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20.   See McGinnis & Pearce, *supra* note 7.

21.   On the reduction of those providing bespoke services, see Sheppard, *supra* note 9 at 1877-79; William E Foster & Andrew Lawson, "When to Praise the Machine: The Promise and Perils of Automated Transactional Drafting" (2017) 69 South Carolina L Rev 597 at 633.

22.   For warnings, see Ian Kerr, "Prediction, pre-emption, presumption: The path of law after the computational turn" in Mireille Hildebrandt & Katja de Vries, eds, *Privacy and Due Process After the Computational Turn* (Routledge, 2013) 91; Michael Geist & Milana Homsi, "Outsourcing our Privacy?: Privacy and Security in a Borderless Commercial World" (2005) 54 UNBLJ 272.

23.   Julia Angwin et al, "Machine Bias" (23 May 2016), online: *ProPublica* <www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>.

24.   *Ibid.*

25.   Andrew G Ferguson, *The Rise of Big Data Policing: Surveillance, Race and the Future of Law Enforcement* (NYU Press, 2017).

26.   "Big Data's Disparate Impact" (2016) 104 Cal L Rev 671 at 675.

against approvals.[27] The authors of the report forecast feedback loops that create an environment ripe for algorithmic discrimination. A feedback loop occurs when machine learning propagates biases built into identifying characteristics such as, income, race, residency, insurance profiles.[28] These programs purport to compute the truthfulness of a refugee's story based on indicators derived from past applications and outcomes. However, in doing so, they build in suppositions that are false, misleading, or addressable, had they been raised in person.[29]

Altogether different concerns have arisen in the use of automated vehicles, such as self-driving cars and autonomous drones. Who should be responsible for accidents caused by self-driving cars if the decision-making matrix was premised on choices authorized by regulation? Can the owner of AI car technology be responsible for an accident, if the programming only permitted limited choice? These types of questions are even more cogent where threat to life is built into design. For example, challenges to human rights clearly arise where autonomous drones are used to carry out surveillance and warfare.[30] However, these issues become more complex when examining how these tools are used by state agents, such as the Coast Guard, in counternarcotics.[31] As Jack Balkin noted, AI presents new problems for how to distribute rights and responsibilities that arise from actions of non-human entities as well as AI agents.[32] These studies provide a glimpse into how the medium can transfer decision-making to automated systems and therefore affect the authority to articulate law. Moreover, the removal of humans from individualised decision making creates an accountability gap that has little parallel in previous theorizing about institutions. This form of proxy discrimination is difficult to detect but also difficult to amend, given how programs are discursively positioned to provide neutral and objective outputs.[33]

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27. See Petra Molnar & Lex Gill, "Bots at the Gate: A Human Rights Analysis of Automated Decision-Making in Canada's Immigration and Refugee System" (University of Toronto, 2018).

28. See Cathy O'Neil, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* (Crown, 2016).

29. *Ibid* at 33-36.

30. See Yoram Dinstein, "Autonomous Weapons and International Humanitarian Law" in Wolff Heintschel von Heinegg, Robert Frau & Tassilo Singer, eds, *Dehumanization of Warfare* (Springer, 2018) 15.

31. See Michael Sinclair, "Proposed Rules to Determine the Legal Use of Autonomous and Semi-Autonomous Platforms in Domestic U.S. Law Enforcement" (2018) 20 NCJ L & Tech 1.

32. "The Path of Robotics Law" (2015) 6 Cal L Rev 45 at 46.

33. See Joshua A Kroll et al, "Accountable Algorithms" (2017) 165 U Pa L Rev 633 (limitations on transparency).

B. THE DISRUPTION OF LEGAL EDUCATION

Despite the proliferation of legal technologies, there is criticism that legal educators have not yet looked inward to analyse their own role and responsibilities in preparing lawyers to practice in this brand-new world. Critics have raised concerns that students are not using relevant technologies in the classroom,[34] nor are they being prepared to use technology in practice.[35] These critics highlight that there remains an unmet need to teach future lawyers how to understand, analyse, explain, and control legal systems.[36] In short, there is little evidence that legal education has undergone any widespread disruption.[37]

Naturally, curriculum reform to include technology has begun. Many law schools have added some technical components within courses or provided elective courses on technology and the practice of law.[38] For instance, virtual learning systems, computer supported peer review,[39] and presentation technologies[40] have been used in some courses to alter assessment but also to teach students about professional communication and collaboration.[41] Similar efforts have been undertaken in legal research and writing,[42] interviewing, communicating,[43] and

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34. Canick, *supra* note 2 at 663, 665-68; Smith, *supra* note 2 at 247-48.

35. See Daniel Bates, "Are 'Digital Natives' Equipped to Conquer the Legal Landscape?" (2013) 13 Leg Info Mgmt 172; Anne Binsfield, "New Barristers' Information Literacy Challenges as They Transition from Education to the Workplace" (2019) 19 Leg Info Mgmt 36; Barbara L Bernier & F Dennis Green, "Law School Reset–Pedagogy, Andragogy & Second Life" in Oliver Goodenough & Marc Lauritsen, eds, *Educating the Digital Lawyer* (LexisNexis, 2012) 11-1.

36. For new efforts at analyzing legal text, see Wolfgang Alschner, Julia Seiermann & Dmitriy Skougarevskiy, "Text of Trade Agreements (ToTA)—A Structured Corpus for the Text-as-Data Analysis of Preferential Trade Agreements" (2018) 15 J Empirical Leg Stud 648.

37. Garon, *supra* note 19; Brescia et al, "Embracing Disruption", *supra* note 7.

38. For an excellent bibliography of efforts in the United States, see Pearl Goldman, "Legal Education and Technology III: An Annotated Bibliography" (2019) 111 Law Libr J 325.

39. See Kevin Ashley & Ilya Goldin, "Computer-Supported Peer Review in a Law School Context" (2015) University of Pittsburg Legal Studies Research Working Paper No 2015-24.

40. See Charles Barker & Claire Sparrow, "Technology and Presentation Skills Teaching: Activity Theory as a Tool for the Design and Evaluation of Strategies for the Use of Video as a Learning Tool in Presentation Skills Teaching" (2016) 7 Eur J L & Tech 1.

41. See Anneka Ferguson & Elizabeth Lee, "Desperately Seeking … Relevant Assessment? A Case Study on the Potential for Using Online Simulated Group Based Learning to Create Sustainable Assessment Practices" (2012) 22 Leg Econ Rev 121.

42. See Paul Maharg, "Convergence and Fragmentation: Legal Research, Legal Informatics and Legal Education" (2014) 5 Eur J L & Tech 1.

43. See Ann Thanaraj, "Making the Case for a Digital Lawyering Framework in Legal Education" (2017) 2017 Intl Rev L 1; Amanda Stickley, "Providing a Law Degree for the 'Real World': Perspective of an Australian Law School" (2011) 45 L Teacher 63.

dispute resolution,[44] as well as the introduction of practice technologies, such as e-discovery.[45] While these changes are faculty-dependent and small in scope, this adoption reflects faculty interest in making technological education relevant to practice.[46] In addition, elective courses and clinics on technology provide a select number of students with the ability to identify legal problems and use technology to resolve them. Some clinics train students on the use of established technologies (such as those dedicated to e-discovery and legal research and writing).[47] Others involve the use of authoring software to enhance current applications or design new ones. For example, several law schools in the United States have used A2J Author software to create apps that turn tacit knowledge held by lawyers into information that could be accessed by under-served populations.[48] Scholarship from faculty members at several schools indicates that students use A2J to master substantive and procedural law and identify the social needs of particular client groups.[49] This approach can be compared with efforts to design entirely new software packages at Suffolk University Law School, in which students learn to generate apps and software.[50] These types of design courses require students to design in tandem with programmers or they teach students how to code.

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44.   See Jordan Goldberg, "Online Dispute Resolution and Why Law Schools Should Prepare Future Lawyers for the Online Forum" (2014) 14 Pepp Disp Resol L Rev 1; Maebh Harding, "Using Interviewing and Negotiation to Further Critical Understanding of Family and Child Law" in Caroline Strevens, Richard Grimes & Edward Phillips, eds, *Legal Education: Simulation in Theory and Practice* (Ashgate, 2014) 127.

45.   See Femi Cadmus, "Five Steps to Successfully Developing a Law Practice Technology Course" (2014) 24 Trends L Library Mgmt & Tech 25 at 27.

46.   See Richard S Granat & Stephanie Kimbro, "The Teaching of Law Practice Management and Technology in Law Schools: A New Paradigm," (2013) 88 Chicago-Kent L Rev 757 at 769-70; Conrad Johnson & Brian Donnelly, "If Only We Knew What We Know" (2013) 88 Chicago-Kent L Rev 729 at 730.

47.   Brian Sites, "The Influence of Algorithms: The Importance of Tracking Technology as Legal Educators" (2016) 23 L Teacher 21.

48.   Johnson & Donnelly, *supra* note 50.

49.   *Ibid*. See also Ronald W Staudt & Andrew P Medeiros, "Access to Justice and Technology Clinics: A 4% Solution" (2013) 88 Chicago-Kent L Rev 695; Tanina Rostain, Roger Skalbeck & Kevin G Mulcahy, "Thinking Like a Lawyer, Designing Like an Architect: Preparing Students for the 21st Century Practice" (2013) 88 Chicago-Kent L Rev 743; Robert C Blitt & Reece Brassler, "Experiencing Experiential Education: A Faculty-Student Perspective on the University of Tennessee College of Law's Adventure in Access to Justice Author" (2016) 50 John Marshall L Rev 11.

50.   See David Colarusso, *Coding the Law*, Syllabus (Suffolk Law School, Fall 2020), online: <docs.google.com/document/d/1qFFojSTz5S1jr0KXgvMUIylH7-atlIVjOCyR_TjRV7w/edit> [perma.cc/96WT-Q58Z].

What these types of courses share is a commitment to using contextual learning about technology as a pedagogic tool. As Simon Canick notes, any singular use of technology for presentations, communication, discovery, practice management, and legal research could be taught as a separate course.[51] However, in doing so, the courses "lack context."[52] Margaret Martin Barry has summarized the benefits of contextual learning succinctly: Clinics provide skills training by relating substantive law to competencies, such as "client interviewing and counselling, communication, fact investigation, drafting, negotiating…ethics, professionalism…problem solving…and social justice."[53] In *Best Practices for Legal Education*, Roy Stuckey et al argue that "context-based education" provides this by teaching "theory, doctrine, and analytical skills," as well as how to produce documents, "resolve human problems, and cultivate practical wisdom."[54]

By design or necessity, students in clinics focus, in whole or in part, on the use of technology in the legal profession.[55] However, despite limited efforts to teach some students to use technology, there seems to be little effort to incorporate technology into legal education for all. There are several explanations for why that is the case.

One of the primary concerns with integrating technology into learning is that law students lack the knowledge needed to work with computational technology in a meaningful way. For example, Ken Grady, who reflects on his teaching in the blog, "An Algorithmic Society," is a proponent of technological training. Nonetheless, he argues for limits due to student inability, how quickly skills become outdated, and limited space in the curriculum.[56] Grady's comments reflect concern that students do not have the necessary foundation in math and statistics to engage effectively in these courses. The inference is that course material will be either too facile to be of any practical use, or too complex to be accessible.

Naturally, these concerns are not uniformly held. Drawing on his experiences, Daniel W. Linna Jr. argues the opposite: that this knowledge gap is what these

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51. Canick, *supra* note 2 at 682.
52. *Ibid.*
53. "Practice Ready: Are We There Yet?" (2012) Boston College JL & Soc Just 247 at 252.
54. *Best Practices for Legal Education* (Clinical Legal Education Association, 2007) at 104.
55. Deborah Maranville, "Infusing Passion and Context into the Traditional Law Curriculum Through Experiential Learning" (2001) 51 J Legal Educ 51 at 53 (optimal learning is achieved from context because of interest in the human character of the issues, better comprehension of application, and better memory storage).
56. "What "Teaching Legal Tech" Could Mean" (1 May 2018), online (blog): *The Algorithmic Society* <medium.com/the-algorithmic-society/what-teaching-legal-tech-could-mean-bf31cf0d4d10>.

courses address—learning how to use statistical analysis and how to employ the tools used to analyse and present that data, such as R, Python, and Tableau.[57] According to him, any increased ability to work with statistical sampling for fraud, algorithms for sentencing, data-driven transactions, or advocacy based on statistical arguments will be of value to practice.[58] Others have raised concerns with students' abilities to complete design projects within a semester and proposed solutions to time restrictions. Stadt et al include the use of design software and assigning projects with a very narrow scope.[59] They also advocate strongly for focusing on projects that improve access to justice for underserved populations, as this involves practice-based skills, including just-in-time learning, intake triage, document assembly, and providing legal information to low-income people.

A second concern with incorporating technology may stem from the refusal to bend to what Margaret Thornton calls corporatist and commodifying trends in legal education.[60] Law schools and their faculty are being asked to train students to practice in ways that produce a faster return on investment for law firms and the legal market.[61] Susan Boyd presents a related concern that a highly competitive environment influenced by corporatism encourages Canadian legal education to focus on market outcomes at the expense of education that advances critical reflection on the law.[62] Commentaries like these raise questions as to whether a focus on the pragmatics of technology will reproduce a positivist and managerial conception of law that students will be ill-equipped to critique or change in their future practice.

Lastly, reticence to embrace technology could stem from an empirical question of whether sole and small firm practitioners (*i.e.*, the bulk of the legal service market) use emerging technologies. Moreover, even if technology plays some role in practice, there is also the question of whether the profession should provide such training once in practice, and not in universities. There is something to be said about the argument that the profession's diminishing interest in training

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57.   "Why Law Students Should Take Quantitative Analysis: Big Data, Algorithms, Courtrooms, Code, and Robot Lawyers" (22 October 2016), online (blog): *LegalTech Lever* <www.legaltechlever.com/2016/10/law-students-take-quantitative-analysis-big-data-algorithms-courtrooms-code-robot-lawyers>.

58.   *Ibid*.

59.   Staudt & Medeiros, *supra* note 54.

60.   "Technocentrism in the Law School: Why the Gender and Colour of Law Remain the Same" (1998) 36 Osgoode Hall LJ 369.

61.   Margaret Thornton, "The Law School, the Market, and the New Knowledge Economy" (2009) 10 German LJ 641.

62.   Susan Boyd, "Corporatism and Legal Education in Canada" (2005) 14 Soc & Leg Stud 287.

entry-level lawyers does not alter the need for universities to focus on teaching critical thinking and legal analysis, rather than day-to-day practice skills.[63]

Taken on the whole, these three reasons reflect some valid reticence about broad curricular change. This overview does not hope to do justice to the depth of thinking that faculty have put into what should be taught in law schools. However, it can explain why Canadian law schools have responded to pressure to provide technology training by increasing learning opportunities in technology for a limited number of interested students, rather than fundamentally altering the delivery of doctrinal material.

II. RYERSON'S PRACTICE CONTRIBUTION—ATTEND TO TECHNOLOGY

Consciousness about how rights are structured through technology should raise questions about how to train students to understand, use, and create legal technologies that attend to particular social values. Therefore, at the heart of skills training is a question about how to teach legal practice as a series of structures that reinforce corporate or governmental uses that may not be aligned with the principles of justice. Systemic learning is distinguished from other kinds of learning by its focus on the structures and systems used to obtain other kinds of knowledge.[64] In law school, learning about legal systems usually involves students in critically analyzing how rules are formulated and implemented so as to generate a particular outcome. Faculty use interdisciplinarity to draw out these reflections and identify how organizations and procedures alter client experience. Instead of only learning positivist law, students are asked to question the structures in which those laws are situated.

Systemic learning is also used to teach legal outcomes caused by jurisdictional difference. Trans-systemic legal programs at McGill University and the University of Victoria are engaged in the same interdisciplinary teaching that permeates legal education in Canada but have added a requirement that students learn multiple legal systems while doing so. Students in these schools learn common law as well as civil and Indigenous law respectively. However, both programs are characterized by efforts to teach their students how to understand the systems within which

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63.   For a discussion of market forces, see Arthurs, "Law", *supra* note 5.

64.   See Max Miller, "Some Theoretical Aspects of Systemic Learning" (2002) 3 Sozialer Sinn 379.

law operates as well as how to think across and between those systems.[65] Systemic learning about law and technology is rationalized where technology alters the substance and procedures of law in ways not easily addressed by the mainstays of legal analysis. This approach draws primarily upon interdisciplinary learning. In her work on the future of coding, Dana Remus contends that lawyers who lack competence to analyse the structural impact of a given technology are not well positioned to deliver critical advocacy.[66] Jamie J. Baker similarly argues that, without knowing how algorithms generate results, lawyers are left to their own devices to evaluate the effects, which ultimately undermines their ability to advise and advocate.[67] To this way of thinking, lawyers should attend to technology as an interdisciplinary arena in which law is situated and experienced. These commentators identify a common concern: that the effect of these kinds of technologies may be to disempower the legal profession, especially when clients need them to advocate in relation to technological impacts.

Where is Ryerson in all of this? Ryerson has made technology one of the pillars of its new law school program and has used central curricular planning to ensure technology skills are included.[68] In the program, students are taken through extended mandatory course work, including intensives in non-legal subject areas deemed helpful for practice. Technology factors into this practice-based curriculum through two types of learning: (1) user-based learning, and (2) innovation-based learning. User-based learning imparts a technical capacity to work with existing technologies and to analyse the effects of uptake. Innovation-based learning shows students how to think about the design and

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65.   In Canada, the law schools at McGill University and University of Victoria stand out in their attempts to centrally design systemic thinking in the legal curriculum in an effort to teach their students both how to understand the systems within which common, civil, and Indigenous law operate, as well as how to think across and between those systems. For discussion of McGill's experience, see Helge Dedek & Armand de Mestral "Born to Be Wild: The Trans-systemic Programme at McGill and the De-Nationalization of Legal Education" (2009) 10 German LJ 889; Patrick H Glenn, "Doin' The Transsystemic" (2005) 50 McGill LJ 86. For discussion of University of Victoria's experience, see Hadley Friedland & Val Napoleon, "Gathering the Threads: Developing a Methodology for Researching and Rebuilding Indigenous Legal Traditions" (2015) 1 Lakehead LJ 16; John Borrows, "Outsider Education: Indigenous Law and Land Based Learning" (2016) 33 Windsor YB Access Just 1; Sarah Morales, "Locating Oneself in One's Research: Learning and Engaging with Law in the Coast Salish World" (2018) 30 J Women & L 144.

66.   Remus, *supra* note 15.

67.   "Beyond the Information Age: The Duty of Technology Competence in the Algorithmic Society" (2018) 69 SCL Rev 557.

68.   For similar recommendations, see Michael R Cassidy, "Reforming the Law School from the Top Down" (2014) 64 J Leg Educ 428.

adoption of new technologies. When these learning approaches are provided in combination with positivist and constructivist approaches, students should be better trained to identify instances where the core outcomes of a given law are altered by procedural or computational technologies.

A.   USER-BASED LEARNING

User learning is driven by the need to prepare students to use technologies already developed and relevant to practice. These may include processes and forms commonly used for court filings or regulatory approvals ("low-tech") as well as digital and computational methods ("high-tech"). Learning involves incorporating technology usage in the curriculum, outlined below.

Like most law programs, Ryerson's first-year curriculum requires students to enroll in courses such as contracts, torts, property, criminal, constitutional, and administrative law. In this first year, proficiency in issue identification, rule identification, and rule application is ensured through traditional legal training. However, first year classes are also co-taught by practitioners who introduce students to practice applications. Examples could include teaching first year contract law in conjunction with a contract that students re-write,[69] and property law in conjunction with electronic filing under the *Personal Property Security Act*.[70] This undertaking reflects a broader shift to include transactional learning in the legal curriculum early and often.[71]

Two technology intensives in first and second year provide hands-on training in technology-related skills considered essential to professional success. The technology innovation intensive introduces students to technological entrepreneurship and design. The coding intensive teaches students how data analytics are used to devise a solution to a specific problem and to use basic programming software to design it.

Ryerson's commitment to technological learning is also reflected in its inclusion of technology-related skills as a national entry to practice competency, which includes the ability to:

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69.   See Glenn D West, "Teaching Contract Drafting through Caselaw—A Syllabus and A Collection of My Musings about Contract Drafting Based upon Recent Cases" (29 August 2017), online (pdf): <www.ssrn.com/abstract=3028971>.

70.   RSO 1990, c P.10.

71.   See Craig Scott, "A Core Curriculum for the Transnational Legal Education of JD and LLB students: Surveying the Approach of the International, Comparative and Transnational Law Program at Osgoode Hall Law School" (2005) 23 Penn St Intl L Rev 757.

    a.   Review options, analyze requirements, evaluate and apply technological solutions to legal issues

    b.   Apply relevant tools, such as artificial intelligence and quantitative legal prediction, to conduct data analytics in a range of legal contexts

    c.   Display digital literacy by communicating with technology professionals to exercise options and effectively communicate digital needs and strategies for solving legal problems

    d.   Apply digital literacy to conduct business process analysis (*i.e.* analyze technology architecture, evaluate options and select the best alternative).[72]

Select second year courses in Business Law and Civil Procedure at Ryerson are organized around intensive doctrinal learning and simulated practice. Students work in groups of seven as part of a simulated firm and produce practice-appropriate work related to two key subjects. Simulations in these courses help students to use doctrine in combination with practice technologies. For example, students are trained in how to use "low-tech" technologies in legal practice, including Word, Excel, PDF, and Google Docs, in addition to legal technologies that are the mainstay of legal practice (Quicklaw and Westlaw). Even training on how to take effective legal notes (*i.e.*, interview notes, discovery notes, et cetera) on laptops would signal curricular change.[73] Canick notes that word processing and PowerPoint appear so basic that most schools overlook training, but firms report that students begin practice without a sophisticated ability to use them.[74]

    Where students use a technology to achieve an outcome for a simulated client or assignment, they become familiar with that particular program. E-discovery simulations illustrate this type of training. Students might review documents, cases, best practice guides and ethics rules, plan conferences, use e-discovery rules, prepare interrogatories, and draft discovery requests and replies that reflect a range of digital sources.[75] Properly planned, this sample exercise reflects what Deborah Maranville calls spiral education: the provision of multiple

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72.   Canadian Common Law Program Approval Committee, *Report on Application by Ryerson University for Approval of Proposed Law School Program* (Federation of Law Societies Canada, 2017) at 152.

73.   Canick, *supra* note 2.

74.   See Monica Goyal, "Tech Competence a Must" (1 September 2017), online: *Canadian Lawyer* <www.canadianlawyermag.com/news/opinion/tech-competence-a-must/274463>; Catherine Sanders Reach, "Essential Tech Skills for the New Lawyer" (2 November 2017), online (blog): *Before the Bar* <abaforlawstudents.com/2017/11/02/essential-tech-skills-for-the-new-lawyer>.

75.   Canick, *supra* note 2.

opportunities to train in the overlap between doctrine and practice in relation to a topic area.[76]

The main concern with user-based learning is that it can operate at the expense of other valuable lessons.[77] Repetitive, systemized practice is not often associated with the type of critical and creative thinking needed to be an excellent advocate.[78] While it seems obvious that too strong a focus on technology use could degenerate into a series of "how-to" courses, it is not an inevitable result. As Justice Lorne Sossin, former Dean of Osgoode Hall Law School, argued, "experiential education has the potential to promote critical thinking about law and the impact of markets more effectively than its classroom doctrinal or theoretical counterparts."[79] The difficulty is how to make room in the curriculum to include a more thoughtful approach.

This is where systemic learning has a role to play. Systemic approaches broaden out advocacy in relation to the use of technology itself. For example, a doctrinal approach to teaching technology might be used to address problematic patterns in a feedback loop that impacts established rights otherwise protected by law. Students can be taught to generate legal arguments that reassert the privilege of a rights-holder in that program or provide interpretations of related doctrine that explain why the interests of other stakeholders should be privileged.[80]

Teaching students to identify the legal impacts of technology is also be achieved through writing, programming, and oral advocacy that promotes socio-legal analysis. A socio-legal (or, "constructivist") approach requires students to delve deeply into the law's effect to understand its systemic characteristics. It turns attention to the non-legal contexts in which law operates (or fails to operate).[81] Paul Maharg implements programs aimed at transactional realism

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76. Maranville, *supra* note 60.

77. See Harry W Arthurs, "The Political Economy of Canadian Legal Education" (1998) 25 JL & Soc'y 14; Harry W Arthurs, "Poor Canadian Legal Education: So Near to Wall Street, So Far From God" (2001) 38 Osgoode Hall LJ 381; Harry W Arthurs, "The State We're In: Legal Education in Canada's New Political Economy" (2001) 20 Windsor YB Access Just 35.

78. See Consultative Group on Research and Education in Law, *Law and Learning: report to the Social Sciences and Humanities Research Council of Canada/by the Consultative Group on Research and Education in Law* (Information Division of The Social Sciences and Humanities Research Council of Canada, 1983).

79. "Experience the Future of Legal Education" (2014) 51 Alta L Rev 849 at 856.

80. See Kieran Tranter, "The Law and Technology Enterprise: Uncovering the Template to Legal Scholarship on Technology" (2011) 3 L Innovation & Tech 31.

81. See *e.g.* Jerome Frank, "Why not a Clinical Lawyer-School?" (1933) 81 U Pa L Rev 907; Jerome Frank, "What Constitutes a Good Legal Education?" (1933) 19 ABA J 723.

to a similar end.[82] A typical approach would involve producing law (including guidelines, policies, forms, and processes) based on an analysis of stakeholder need, rather than resorting solely to precedent.

Science and Technology scholars have long reflected on these operational contexts in their descriptions of how law operates and impacts others.[83] For example, Sheila Jasanoff uses an institutional lens to describe how law is used to articulate societal needs and shape scientific outputs.[84] Laurence Tribe uses environmental assessment to provide an institutional approach to describing law's effect on regulation and expert practice.[85] Other scholars have sought to describe the opposite—how law is shaped by society's processes.[86] For example, network theory is often used to provide deep descriptions of scientific actors[87] who impact law.[88] Moreover, law is often interpreted in order to address technology's impacts. For example, Robert A. Hillman and Jeffrey J. Rachlinski argued that the internet did not fundamentally alter the theories of blanket assent that underpin the interpretation of standard form consumer contracts.[89] However, they noted the medium can have a unique effect on factors that normally impact interpretation: the lack of social contact, the way marketing and contracting are blended online, and changes to cognitive decision making.[90]

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82. See *Transforming Legal Education: Learning and Teaching the Law in the Early Twenty-first Century* (Ashgate, 2007) at 14.

83. This approach has usually been fueled by scholarship associated with the study of science and technology.

84. See Ronald Brickman, Sheila Jasanoff & Thomas Ilgen, *Controlling Chemicals: The Politics of Regulation in Europe and the United States* (Cornell University Press, 1985); Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Twentieth Century Fund, 1997); Alex Faulkner, Bettina Lange & Christopher Lawless, "Introduction: Material Worlds: Intersections of Law, Science, Technology, and Society" (2012) 39 JL & Soc'y 1.

85. Laurence H Tribe, *Channeling Technology Through Law* (Bracton Press, 1973).

86. See generally, Niklas Luhmann, *Law as a Social System*, translated by Klaus Ziegert (Oxford University Press, 2004); Gunther Teubner, "How the Law Thinks: Toward a Constructivist Epistemology of Law" (1989) 23 L & Soc'y Rev 727; Gunther Teubner, *Law as an Autopoietic System* (Oxford University Press, 1993).

87. "Scientific Objects and Legal Objectivity" in Alain Pottage & Martha Mundy, eds, *Law, Anthropology, and the Constitution of the Social: Making Persons and Things* (Cambridge University Press, 2004) 73. See also Ron Levi & Mariana Valverde, "Studying Law by Association: Bruno Latour Goes to the Conseil d'État" (2008) 33 Law & Soc Inquiry 805.

88. "The Architecture of Authority: The Place of Law in the Space of Science" in Austin Sarat, Lawrence Douglas & Martha Merrill Umphrey, eds, *The Place of Law* (University of Michigan Press, 2003) 75.

89. See "Standard Form Contracting in the Electronic Age" (2002) 77 NYUL Rev 429

90. *Ibid.*

In this approach, practice technologies are used in combination with social science methodologies to provide students with a critical understanding of the law–technology interface. Students can use these descriptions to identify social needs and convert them to political and ethical claims about the way law should be accessed or implemented.

Simulation in second year is also meant to scale up the learning students traditionally obtain through legal clinics. On the job, students must familiarize themselves with the substantive law needed to offer advice as well as become proficient in the procedural and documentary requirements of practice.[91] Naturally, simulation is not the same as clinical learning, which will be undertaken by students in their third-year placements. As Karen Barton, Patricia McKellar, and Paul Maharg point out about their own experience with transactional learning, simulation cannot replicate the authenticity of real clinical work.[92] Nonetheless, the authors describe successful outcomes where drafters constantly attend to the learning objectives and capabilities needed to mimic authentic practice. The detailed insights of those using simulation will be helpful in reviewing and revising the technology learning outcomes Ryerson will undertake.

B.   INNOVATION-BASED LEARNING

In contrast to user-based learning, innovation-based learning involves students in designing processes, forms, digital systems, and computational methodologies for social good. Innovation training is supported by Ryerson through mandatory technology courses: Data, Code, and Social Innovation and Access to Justice and Technology. Both involve students in design but require learning different skills.

In Data, Code and Social Innovation, students identify an emerging legal problem through data analysis. The emphasis is on recognizing client needs, identifying problems, and using data analytics and knowledge generation software to generate multi-faceted solutions. A focus on social innovation reflects a shift in legal education to problem solving, community engagement, law reform, and innovation for social good.[93] However, this course requires students to draw on big data sets to analyse social problems and relevant solutions to achieve these ends. Students will therefore analyse socio-legal scholarship and

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91.   See *e.g.* Patience A Crowder, "Designing a Transactional Law Clinic for Life-Long Learning" (2015) 19 Lewis & Clark L Rev 413.

92.   "Authentic Fictions: Simulation, Professionalism and Legal Learning" (2007) 14 Clinical L Rev 143.

93.   See *e.g.* Duke Law, "Center on Law & Technology," online: <law.duke.edu/dclt> (for an example of curriculum and courses on law and technology at Duke Law).

undertake stakeholder interviews, but also use legal analytics—an approach that draws on several data-based technologies that find patterns in data sets and forecasts future needs.

In the second course, Access to Justice and Technology, students will identify barriers to justice, propose solutions, and critically evaluate them. With an emphasis on accessible technology, students will design solutions aimed at making legal services more affordable for individuals and organizations of limited means. This orients students towards creative processes as a foundational way to approach law. Like other programs with similar courses,[94] Access to Justice and Technology will have students use econometrics and machine learning for design and use authoring software to develop prototypes.[95]

Lastly, innovation training will be buttressed by the experience and opportunities provided by Ryerson's Legal Innovation Zone (LIZ) and the Cyber-Security Catalyst at Ryerson. The LIZ is Ryerson's startup incubator that supports legal tech entrepreneurship. The Catalyst acts as a source of cybersecurity training and policy development. Both entities have developed curricula aimed at technology and law.

To be realistic, it is likely that only a few law students in the program will go on to design new technologies upon graduation. However, iterative experimentation in the classroom treats innovation as a discipline that teaches students to find the right problems to solve, develop solutions through prototypes, test them, and convince others to use them.

This approach has several potential learning outcomes. One outcome of innovation learning is that it teaches students to better service clients who are innovators or are impacted by innovation. While lawyers will continue to use to basic legal principles, representation will be limited if they do not understand how the finer points of a technology work. Programs that give primacy to one interpretation over another involve judges in evaluating technological design. Advocacy therefore requires lawyers capable of explaining to courts the impacts of program design on legal rights and policy preferences.[96] With design

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94.   Staudt & Medeiros, *supra* note 54.

95.   For a course taught at Columbia Law School, see Joshua Mitts, "Data and Predictive Coding for Lawyers" (January 2019), online: *Columbia Law School* <www.law.columbia.edu/academics/courses/24238. See also Aaron Goodman, "Predictive Coding: A Better Way to Deal with Electronically Stored Information" (2016) 43 Litigation 23. For a similar course description, see Jonathan Koehler, "Quantitative Reasoning in the Law" (May 2019), online: *Northwestern University: Pritzker School of Law* <www.law.northwestern.edu/academics/curricular-offerings/coursecatalog/details.cfm?CourseID=1269>.

96.   Kroll et al, *supra* note 33.

experience, lawyers should be better trained to advocate for competing rights and entitlements created by software programs.[97]

Lack of technical capacity to explain and advocate for changes to technology is a particular challenge for those tasked with meeting stakeholder goals.[98] For example, the Treasury Board of Canada Secretariat has noted that the government will continue to adopt emerging technologies in its service and management practices. However, should it adopt these technologies without hiring employees capable of understanding, evaluating, and explaining them, it will be reliant on the technical capacity of the private sector. With the private sector in control, governments and the public will become increasingly beholden to paying costs dictated by a small group of providers and complying with the sector's competitive interests to keep source code unavailable for widespread scrutiny.[99]

Smart contracts, which self-execute and supposedly limit the dependency on lawyers, illustrate this gap in the private sector. There remain outstanding questions about the data points and conditions upon which those contracts self-execute. The verification methods implicate the need for analysts to evaluate the technology's value to different types of contracting parties and stakeholders. Lawyers able to analyse the legal implications of complex algorithms and improve them therefore serve an important function in an automated future.

A second outcome of innovation learning that attends to systemic effects could be to provide students with the opportunity to be innovators themselves. As used here, the term "legal innovation" is implicitly tied to creativity and design thinking. Jeanne Liedtka, Randy Salzman, and Daisy Azer define design thinking as "a problem-solving approach with a unique set of qualities: it is human centred, possibility driven, option focused, and iterative."[100] Rather than confine notions of innovation to big breakthroughs by exceptional people, they foresee a future where everyone can use design thinking as a common language by which to solve problems. This encourages distinct shifts in mindsets and behaviours towards democratized design. It is not only about the design of products,

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97. Tranter, *supra* note 92.

98. See *Responsible Artificial Intelligence in the Government of Canada*, version 2, Digital Disruption White Paper Series (TBCS, 10 April 2018), online: <docs.google.com/document/d/1Sn-qBZUXEUG4dVk909eSg5qvfbpNlRhzIefWPtBwbxY/edit#> [*Responsible Artifical Intelligence*]. For discussion in relation to legal practice, see Law Society of Ontario, "Practice Management Guidelines on Technology," online: <lso.ca/lawyers/practice-supports-and-resources/practice-management-guidelines/technology>.

99. *Responsible Artificial Intelligence*, *supra* note 115 at 29.

100. *Design Thinking for the Greater Good: Innovation in the Social Sector* (Columbia University Press, 2017) at 6.

or even user experience. It is a problem-solving process that complements other professional methodologies.

Scholars, such as Paul Gowder, take up this call for democratized design in advocacy for collective action as a design principle. Rather than build innovations that make legal conflict cheaper and supposedly more accessible, Gowder advocates for tools that can advance a more egalitarian access to justice. He illustrates his point by comparing technologies that make highly invasive practices by powerful actors more efficient versus those that use data to promote collective action. Examples of accessible technologies are the Miranda App, which provides suspects with a computerized message,[101] or smart city schemes that authorize extensive surveillance in exchange for market access.[102] In contrast, collective action technologies involve creative thinking about overcoming disincentives to individual action. For example, Gowder conceives of a service that allows cancellation of automated standard form contracts (*e.g.*, phone contracts) with discriminatory clauses where a critical mass of claimants is reached.[103] This aims to overcome a company's disinterest in individual cancellations but intense interest in large-scale cancellation. Gowder sees this as an abstraction of the class action; a technology that allows individuals to overcome impediments to access through collective action.

A third outcome of innovation learning that attends to systemic effects would be to train students to be critical users of innovation. Teaching innovation in a law school requires attention to the aims of innovative design and who will assume its costs and benefits. Studies on design thinking and governance illustrate these processes.[104] For example, in a recent study by Brian McInnis et al, the authors document their use of crowdsourcing law and policy to rethink crowd-civic systems.[105] In their workshop, they used design thinking to address both the opportunities and challenges of crowd-civic systems to develop best practices for public engagement with law and policy.[106] This study focused attention on several

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101. See Andrew Guthrie Ferguson & Richard A Leo, "The Miranda App: Metaphor and Machine" (2017) 97 BUL Rev 935.

102. See Jathan Sadowski & Frank Pasquale, "The spectrum of control: A social theory of the smart city" (2015) 20 First Monday, online: <firstmonday.org/article/view/5903/4660>.

103. *Supra* note 2.

104. See Michael Howlett, "From the 'old' to the 'new' policy design: design thinking beyond markets and collaborative governance" (2014) 47 Policy Sciences 187.

105. "Crowdsourcing Law and Policy: A Design-Thinking Approach to Crowd-Civic Systems" in *Companion of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing, Portland, February 2017* (Association for Computing Machinery, 2017).

106. *Ibid.*

key questions, such as whose views are prioritized in crowd-civic systems, how the results are used, how results from different systems can be compared, what barriers and risks exist, et cetera.

III. CONCLUSION

To train lawyers to provide the same legal service that generations of lawyers have provided is necessary but not sufficient for future practice. Incorporating technology (as a tool, as a discourse, and as a social lens) into legal education seems to be the way to move beyond the current model. Creating space in the legal curriculum to deliver a systemic approach to law and technology is key to developing critical thinking about legal service and the production of law.[107]

There is great skepticism that technology training can be incorporated into legal education in a way that makes real change. However, forestalling curriculum reform implicates law schools in the formation of technology and law as an elite practice area. As it stands now, claims involving technology require the involvement of computer scientists and programmers who understand law and legal obligations, or alternatively, lawyers who understand programming. A future where so few can understand both means that the practice of law and technology will remain the purview of an elite few.

What is happening at Ryerson is not simply a pragmatic effort to train students to service clients more efficiently. Once one begins to approach the idea that law is deeply implicated in the technology, then what is at stake is the essential role that lawyers play as advocates in relation to those technologies. Therefore, layered into Ryerson's program is a symbiotic effort to explore how to teach legal innovation and how to teach those who will be at the forefront of understanding its effects.

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107. For example, in response to the demand for interdisciplinary research in this field, New York University has launched the AI Now Institute, a research center dedicated to examining the social implications of artificial intelligence. The Ethics and Governance of Artificial Intelligence Initiative, a hybrid research effort and philanthropic fund led jointly by the Berkman Klein Center at Harvard University and the MIT Media Lab, is another example of academic development in the field. See AI Now Institute, "AI Now," online: <ainowinstitute.org>; "The Ethics and Governance of Artificial Intelligence Initiative," online: <aiethicsinitiative.org>; Christopher Bavitz & Kira Hessekiel, "Algorithms and Justice: Examining the role of the state in the development and deployment of algorithmic technologies" (11 July 2018), online: *Berkman Klein Center* <cyber.harvard.edu/story/2018-07/algorithms-and-justice>; Canadian Institute for Advanced Research, "CIFAR Pan-Canadian Artificial Intelligence Strategy" online: <www.cifar.ca/ai/pan-canadian-artificial-intelligence-strategy>.

It is early days yet. Nevertheless, at the core of the program already lies an undertaking to engage with legal technology in practice—but never be limited in defining what that might mean.