

Project Fiasco: An Analysis of Ontario's Electronic Health Record Project

A Thesis Submitted to the
College of Graduate Studies and Research
In Partial Fulfillment of the Requirement
For the Degree of Masters of Public Policy
In the Johnson-Shoyama Graduate School of Public Policy
University of Saskatchewan

by
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Project Fiasco: An Analysis of Ontario's Electronic Health Record Project

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Suggested Citation

Bretscher, P.K. Project Fiasco: An Analysis of Ontario's Electronic Health Record Project. M.P.P. Thesis, Johnson-Shoyama Graduate School of Public Policy. University of Saskatchewan: 2011.

Abstract

Policy failure is a recurring theme in large government technology projects. The Ontario Electronic Health Record (EHR) project is one of the most recent, and high profile, Canadian examples.

The EHR project had two main phases – the design phase (in which the architecture of the system was determined) and an implementation phase (in which the operation of the system was carried out). This study has two objectives: first, to develop a set of frameworks that can be used to understand the design phase and the implementation phases; and second, to use these frameworks to describe and to understand why the EHR initiative was so unsuccessful.

To facilitate an understanding of the implementation phase of a project, a game theoretic framework is employed that classifies technology solutions as either independent or interdependent. When solutions are interdependent, the framework suggests that, in order to obtain the greatest value, the government should exert its authority to ensure the coordination and cooperation of the actors in the system.

To understand the design phase of a project, a framework is developed that links together the nature of the problem with the type of organization best suited to solving the problem. I argue that the complexity, or decomposability, of a problem directly affects the optimal method of a search for solutions, and the optimal means of organizing that search.

These two frameworks are then applied to Ontario's EHR project to analyze why the EHR project was so unsuccessful. I conclude that decision makers failed to consider the interdependent nature of EHR solutions; instead, they encouraged independent actors to develop their own ehealth solutions, effectively undermining the provincial goal of an interoperable system. I also conclude that decision makers misdiagnosed the nature of the EHR problem, resulting in an ineffective search

procedure to locate an EHR solution. These two errors resulted in a policy fiasco that was manifested in almost total project failure and a resulting high degree of public outrage. We also speculate on why these errors were made.

Key Words: Electronic Health Record (EHR), ehealth, Ontario, design, implementation, fiasco.

ACKNOWLEDGEMENTS

The author wishes to thank the following individuals who contributed to this thesis:

Dr. Murray Fulton, my supervisor, convinced me to change the trajectory of my academic studies and write a thesis. Without his guidance, keen insights, and support, this thesis would never have been written. While I have limited experience with thesis supervision, I am quite certain that my experiences were atypical. I have gained enormously from my personal and intellectual relationship with Murray. All I can offer in return is my enduring gratitude.

Dr. Michael Atkinson provided invaluable support during my two years at the School, as a course instructor and as member of my thesis committee. A term paper written for one of his courses served as the impetus for this thesis. I am indebted to Michael for his thoughtful feedback and suggestions throughout the writing process.

Dr. Kathleen (Kathy) McNutt joined my committee at the later stages of the process, but her thoughts, feedback, and editing were extremely helpful. I am sincerely grateful to Kathy for her advice and support.

The faculty, staff, and students at the JSGSPP made these last two years memorable and enjoyable. In particular, I would like to thank my fellow students, Ata-Ul Munim and Sara McPhee-Knowles, for their support and friendship.

My parents, Dr. Peter Bretscher and Dr. Calliopi Havele, who are both faculty at the College of Medicine (University of Saskatchewan), provided unconditional love and emotional support. Without their encouragement, I would not have pursued graduate studies, and would not be where I am today. My sister, Dr. Anna Bretscher, a computer scientist at the University of Toronto, helped me navigate some of the technology problems in this thesis, and has been a source of strength.

My dear friends, Dr. Alex Dickson, who recently completed his graduate studies at the University of Chicago, and Bentley Allan, who is nearing completion of his PhD at Ohio State University, have been like family to me. The intellectual origins of this thesis stem from a discussion held between the three of us during a trip to Chicago in 2009. If every American thanksgiving holiday could be this intellectually productive, I would have enough ideas to last a lifetime. And to Izabella de Barbaro, another dear friend and Alex's life partner, whose eternal optimism and positive outlook on life has been a constant source inspiration for me.

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ACRONYMS

eCHN	electronic Child Health Network
iEHR	interoperable Electronic Health Record
CCAC	Community Care Access Corporation
CMA	Canadian Medical Association
EHR	Electronic Health Record
EMR	Electronic Medical Record
HAA	Hospital Accountability Agreements
HiNet	Child Health Network – Health Information Network
ICD	International Classification of Diseases
ICT	Information, Communication, Technology
IAA	Insource-Agency Administration
IWA	Insource-Weberian Administration
LHIN	Local Health Integration Network
LOINC	Logical Observations Identifiers Names and Codes
MOHLTC	Ministry of Health and Long Term Care
OHA	Ontario Hospital Association
OHSS	Ontario Health System Scorecard
SNOWMED CT	Systematized Nomenclature of Medicine – Clinical Terms
SKHN	Sick Kids Hospital Network
SSHA	Smart Systems for Health Agency
WTIS	Wait Times Information System
WHO	World Health Organization

Chapter One

INTRODUCTION

In many respects, the new millennium has reinvigorated an old debate regarding public policy failure, and the role, theory and practice of public governance. The great financial debacle of 2008 has led academics, practitioners, and public writ large to question the capacity of government to respond to public problems and effectively govern in an increasingly complex world. The ubiquity of government failure, both real and imagined, has created a sense of malaise amongst the general public with respect to their governments. Policy scientists, students of public administration, and policy makers are in many ways facing a test of their legitimacy. Despite decades of progress in analyzing and explaining policy failure, and developing a series of prescriptive solutions to mitigate disaster, the negative media headlines keep coming. Commentators readily decry the numerous cases of government incompetence, fraud, waste and abuse. Moreover, unlike the 1980s, when the war between conservatives and liberals over the role and capacity of government was waged, the general public today appears increasingly convinced that government can simply not get it right. Indeed, we live in era where the legitimacy of our public institutions is under threat. For policy scientists, who are often predisposed to understand and help improve the practice of government,

fundamental questions are (re)emerging: Are we facing problems of knowledge dissemination? Do we have the necessary analytical tools to understand policy failure? If not, what does this imply for our prescriptive aims and ambitions?¹

Policy failure, in its many guises, is a central concern of public policy experts. This author is centrally concerned with high rate of failure in large, complex, government information, communication, and technology (ICT) projects. By virtually any standard, it is widely accepted that government ICT projects are notorious for succumbing to policy failure. Government led ICT projects are infamous for being over budget,² while failing to deliver on their promise. Many of these failures have been popularized in the media, and gained an iconic, albeit negative, status in the public consciousness. Policy failures, like the UK National Health Services' massive \$12 billion electronic health records (EHR) initiative and the \$20 billion US Tax Modernization Project,³ have led many in the public sphere to believe that government simply can not handle the complexity of large ICT projects. Beyond the popular narrative policy failure, there is now a substantial body of empirical work that demonstrates the degree to which government ICT projects have failed, at least on the budgetary level. The frequently cited Standish Group study on ICT procurement in the United States found that over 31 percent of projects were cancelled before completion, while 53 percent were completed but over budget by an average of 189 percent.⁴ Bent Flyvbjerg, the widely respected Professor of Management at Oxford University's Saïd Business School, and an expert in mega projects, also examined the budgetary performance of government ICT projects. According to Flyvbjerg's analysis, given the inaccuracies in budgeting government

¹ These questions regarding the crisis of governance were framed by Bovens and 't Hart in their seminal work on policy fiascoes; see: Mark Bovens and Paul 't Hart, *Understanding Policy Fiascoes* (London: Transaction Publishing, 1998), p. 173.

² Mark Keil and others, "Understanding Runaway Information Technology Projects: Results from an International Research Program Based on Escalation Theory," *Journal of Management Information* 11, no. 3 (1994/1995), p. 72.

³ Oxford Analytica Daily Brief, "International: E-government potential is misunderstood," *Oxford Analytica*, (May 7, 2008).

⁴ Sanford Borins, "Information Technology in the Public Sector," in *The Handbook of Canadian Public Administration*, ed. Christopher Dunn (Toronto: Oxford University Press Canada, 2002), p. 457.

ICT projects, if decision makers wanted to have 80% certainty that their projects would come in at or under budget, they would have to revise, on average, their initial cost estimates upwards of 200%.⁵ The ubiquity of ICT project failure, again, in budgetary terms, is strongly supported by the large empirical study conducted by Mark Keith and his colleagues, who found that two and three-fold budget overruns are not uncommon in ICT projects.⁶ Given the available statistics, the general public should be forgiven for believing that government always gets in wrong when it comes to public ICT projects.

Despite public skepticism about the capacity of government to effectively manage complex ICT projects, there is an intuitive sense amongst public policy and technology professions that e-government, in its many guises, can substantially improve government performance. Indeed, ICT is becoming increasingly essential to all aspects of public sector delivery, and spending on ICT by government continues to increase year over year.⁷ The challenge for government, of course, is that new developments in both hardware and software capacity occur briskly, and technology rapidly becomes obsolete. Governments are continuously challenged to make frequent spending commitments simply to keep pace with technological change in society, and keep e-systems current. Fortunately, governments in Canada have met a certain level of e-sophistication demanded by the public. The public can now go online and pay their taxes, apply for government jobs, receive e-bulletins relating to public health, or look up the parliamentary record on Hansard. While governments have increasingly moved online, like all organizations in society, the real challenge for government has been managing larger, complex ICT systems, which require significant resources to develop and deploy.

⁵ Bent Flyvbjerg, "From Nobel Prize to Project Management: Getting Risk Right," *Project Management Journal* 37, no. 3 (2006), p. 11.

⁶ Keil and others, *Understanding Runaway Information Technology Projects: Results from an International Research Program Based on Escalation Theory*, p. 74.

⁷ Borins, *Information Technology in the Public Sector*, p. 456.

There is a significant danger to the public good if government becomes unwilling to undertake large, complex ICT projects. Given governments' unenviable success record when it comes to large ICT projects, this is a matter of serious concern. With each successive ICT failure, the public becomes more reticent to accept significant public spending on large future projects. Moreover, governments become increasingly unwilling to undertake ICT projects without the support of the people. Given the promise of ICT projects in general, to improve efficiency and the public welfare, it is critically important that government succeed. Failure breeds contempt. Success breeds opportunity and acceptance. Without support of the governed, political decision makers will be unwilling to undertake large, complex ICT projects irrespective of the potential positive rate of return, given the likelihood that it could end up as a policy failure, or worse, as a fiasco.

Perhaps nowhere is the promise of a new complex ICT system more apparent than in the development of electronic health records (EHRs) for patients in the Canadian public healthcare system. Spending on healthcare in Canada reached \$191.6 billion in 2010, or \$5,614 for every man woman and child.⁸ Despite significant public outlays for healthcare, the vast majority of health records are made and updated as they were 100 years ago, with pen and paper. Each year, the health system produces over 2000 healthcare transactions per minute, or more than 1 billion per year, which includes 400 million laboratory tests, 382 million drug prescriptions, 332 million visits to physicians' offices and 35 million diagnostic images.⁹ For health experts, the ability to capture this information in an individual electronic health record, which is both permanent and transferable, has tremendous promise to both improve patient care and reduce healthcare costs. If successfully implemented, an EHR would, for example, allow an emergency room physician in Toronto, who is treating a patient, to instantly access that patient's entire medical history, whether

⁸ Canadian Institute for Health Information, "National Health Expenditure Trends, 1975-2010," http://secure.cihi.ca/cihiweb/products/NHEX_Trends_Report_2010_final_ENG_web.pdf (accessed February 14, 2011), p. 1-4.

⁹ Jim McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, Toronto: Queen's Printer for Ontario, (2009), p. 5.

that patient lives around the block, or in another city, like North Bay, Ontario. With healthcare costs rising at an alarming rate, well above the cost of inflation, health policy experts have viewed EHR, and ehealth,¹⁰ as a silver bullet that can reduce costs by eliminating duplicate tests, increasing system efficiency, and improving overall patient care through information consolidation. While estimates of the annual cost savings from the introduction of EHR vary, from \$1.1 billion in Ontario¹¹ to \$6 billion nationally,¹² experts agree that the introduction of this new and essential tool could profoundly change healthcare in Canada for the better.

Beyond the demand for EHRs by health professionals and public policy makers, the public appears genuinely enthused about promise of bringing Canada's healthcare system into the electronic age. In 2007, the Canadian Health Infoway (*Infoway*)¹³ reported that almost 9 in 10 Canadians (87%) viewed timely and easy access to personal health information as integral to the provision of quality care, while at least one in two Canadians were concerned about serious mistakes in diagnoses or treatment due to incomplete, inaccurate, or illegible patient information.¹⁴

Given the promise of EHR in Canada to improve the public healthcare system, governments at both levels, federal and provincial, committed in September 2000 to develop an EHR for all Canadians, while in Ontario, Canada's largest province, planning for EHR began in the late 1990s. The headline story of Ontario's EHR project is now well known to media observers and the general public: the billion dollar scandal. The scathing October 2009 Special Report of the Office of the Auditor

¹⁰ A brief note on terminology: "e-health" and "ehealth" refers broadly to electronic health care initiatives, irrespective of jurisdiction, while "eHealth" refers to eHealth Ontario, an agency established by the government of Ontario tasked with developing the electronic health records (EHR) system.

¹¹ Richard C. Alvarez, "The Promise of e-Health - a Canadian Perspective," *EHealth International* 1, no. 4 (2002), pp. 4, 5.

¹² McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p 5.

¹³ The Canadian Health Infoway, a non-profit organization, was established by the federal government in 2001 and is tasked with accelerating the development of EHR systems across Canada.

¹⁴ Canada Health Infoway, "Electronic Health Information and Privacy Survey: What Canadians Think - 2007, Final Report," http://www2.infoway-inforoute.ca/Documents/EKOS_Final%20report_EN.pdf (accessed February 14, 2011), p. 2.

General of Ontario confirmed, in many ways, what opposition politicians and the public had been claiming for years: the Government of Ontario had effectively spent upwards of one billion dollars on an EHR initiative, and had little to show for its efforts.¹⁵ Senior officials were fired, a minister resigned, the project was reorganized, and opposition leaders at Queen's Park (the provincial parliament) called for a full public inquiry into the development of Ontario's EHR system. Indeed, given the apparent scale of the failure, the EHR project in Ontario has unsurprisingly become a popular cultural reference point in Canada, to which other government activity is compared. It is not uncommon to hear, in the House of Commons, a politician argue, 'the government is a just a few steps away from another billion dollar failure like eHealth in Ontario.'¹⁶

In many ways, Ontario's EHR scandal appears like many other large, complex ICT project gone wrong in the hands of government. The fear, of course, is that governments across Canada will be reticent to take on future projects of similar scale and complexity, given the Ontario EHR legacy. At question, therefore, is whether Ontario's EHR was truly a policy failure, and if so, why was this the case, and what lessons can be gleaned for the future. First, let us briefly address some conceptual considerations as to what constitutes policy failure or a policy fiasco.

POLICY FAILURE

Defining policy failure has long been a challenge for public policy experts. In the public sphere and popular media, labels of policy "failure" are omnipresent and applied in the most sensational forms. It is common in our political culture to regularly hear of "scandals and failures",¹⁷ "policy fiascoes",¹⁸ or "billion dollar

¹⁵ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p 5.

¹⁶ See, for example, the Committee debate in the Canadian parliament: Hansard, *House of Commons, Health Committee, 40:2 Committee Evidence - HESA - 47*, (November 30, 2009).

¹⁷ Tanya Talaga, "EHealth Scandal Reaches Premier's Inner Circle," *Toronto Star*, sec. A 01, June 11, 2009.

boondoggles”¹⁹ without a thorough examination of facts, or more importantly, an acceptable definition of what constitutes “failure” or “fiasco”. For policy experts, defining failure appears at times to be an intractable problem. What is policy failure? If we can engineer an acceptable definition of a policy failure, when does a failure become a fiasco? Fortunately, there is some agreement amongst the experts on what constitutes policy failure, or at least the analytical dimensions of the debate have become clear.

Policy failure has both a normative and empirical dimension. The empirical dimensions of policy failure are relatively straightforward, and easy to comprehend. For positivists, who tend to favour a single analytical lens, policy failure occurs when evaluators conclude that a program/project fails to meet official objectives, attain certain performance standards, or comes in over the budgeted amount. For strict adherents to positivist philosophy in the policy sciences, the empirical evaluation and judgment (success vs. failure) must occur over a discrete period of time. That is, historical revisionism, or an *ex post* evaluation with a significant time lag, has no place in defining policy success or failure.

Policy failure can also be conceptualized to include normative considerations, which by definition, are subject to change over time. Therefore, the incorporation of normative considerations can easily alter the interpretation of policy success and failure, particularly with an *ex post* evaluative lens. We can examine the difference between empirical and normative considerations by way of example. Consider the construction of the Sydney Opera House, one of the iconic architectural landmarks of the 20th century. Planning for the multi-venue performing arts centre began in the late 1940s, and construction began in the late 1950s, with a project budget estimated at \$7 million. Ultimately, the project was formally completed in 1973, ten years late,

¹⁸ Jim Coyle, "McGuinty's Need for Speed Led to eHealth Fiasco," *Toronto Star*, sec. A 10, June 19, 2009.

¹⁹ Tanya Talaga, "Critics Roast Government Over \$647M Boondoggle; Ontario's Abandoned Medical e-Records Plan Called a Waste of Cash," *Toronto Star*, sec. A 01, August 8, 2009.

and fourteen times over budget (\$102 million). In Peter Hall's seminal study of great planning disasters, the Sydney Opera House is described as a catastrophe.²⁰ Indeed, a strict positivist interpretation of the project suggests that the Opera House is a policy failure *par excellence*. However, a normative interpretation of this project suggests that failure is relative. In 1973, the Sydney Opera House was viewed as an iconic failure, but the passage of time has converted it into an icon of incalculable value to the city.²¹ The passage of time, and normative reconsiderations of the project, have led most observers to conclude that the Sydney Opera House was certainly worth the money, and most definitely, an ultimate success. Therefore, we can consider the Sydney Opera House both an empirical policy failure, and a normative success.

Beyond the normative and empirical considerations of what constitutes policy failure, there is also the issue of degrees of failure. What differentiates a policy failure from a policy fiasco? The most common working definition of a policy fiasco comes from Mark Bovens and Paul 't Hart, two leading public administration experts, who argue that:

A policy fiasco is a negative event that is perceived by a socially and politically significant group of people in the community to be at least partially caused by avoidable and blameworthy failures of public policymakers.²²

Bovens and 't Hart also differentiate between what constitutes a policy failure and a policy fiasco:

Failure therefore differs from fiasco in that the former refers to performance defects of any size or seriousness, which may or may not be politicized, whereas fiasco only refers to situations of: (a) subjectively significant social damage, that (b) are highly politicized.²³

²⁰ Peter Hall, *Great Planning Disasters* (Harmondsworth: Penguin, 1982), pp. 138-51.

²¹ Michael Moran, "Not Steering but Drowning: Policy Catastrophe and the Regulatory State," *The Political Quarterly* 72, no. 4 (2001), pp. 415-417.

²² Bovens and 't Hart, *Understanding Policy Fiascos*, p. 15.

²³ *Ibid.*, p. 15.

The holistic definition of failure provided by Bovens and 't Hart includes both positive and normative considerations and will be used for the purpose of this exercise, with the caveat that this study is examining an event, the development of EHRs in Ontario, at this specific point in time. Hence, while normative perceptions of the project may change, we are concerned with the immediate, and how both the EHR project has been managed and perceived by the public. Moreover, for the purpose of this study, we will ignore any technical distinctions which may, or may not, exist between a "policy failure" vs. "project failure" and "policy fiasco" vs. "project fiasco"; functionally, terms "project" and "policy" are synonymous and will be used interchangeably in this study. To parse definitions here, between policy and project, invites only mundane debate and is inconsequential to the larger considerations at issue.

Employing Bovens and 't Harts definition, with our noted caveat, the EHR initiative in Ontario was a prototypical example of a policy fiasco. As we will examine in greater detail later, not only did the EHR initiative meet the looser criterion of a policy failure on technical, positivist, grounds (performance standards, budget overruns, etc.), it meets the stricter criteria of policy fiasco. The Ontario EHR initiative certainly caused subjectively significant social damage in at least three discrete ways: (1) the lack of a functional system undoubtedly resulted in less than optimal care being delivered through the public system, given care standards available in jurisdictions with functional EHR systems; (2) the cost to society, in the case of \$1 billion of government spending; and (3) the loss of legitimacy and public trust in government, by the people of Ontario. Finally, the EHR scandal certainly meets the criteria of a highly politicized event, as defined in a policy fiasco. Through the 2000s, no other political issue, or government initiative, has become more criticized and captured the public imagination (in a negative way), than the EHR initiative in Ontario.

If we can accept that Ontario's EHR project does constitute a policy fiasco, at least on a *prima facie* basis, then the issue certainly warrants further analysis and attention.

Certain questions deserve to be asked and answered. How did this particular fiasco unfold, and why? Given the challenges of implementing a large-scale complex ICT system, did the government avail themselves of appropriate strategies to manage the project? What went right, and what went wrong? Perhaps more importantly, given the high failure rate of ICT projects across governments, what lessons can be gleaned from this particular policy fiasco? Quite simply, how can government seek to avoid future policy fiascoes when designing and implementing large ICT projects?

The failure of Ontario's EHR project specifically, and large-scale government ICT projects in general, raise another important question: Do policy scientists have the necessary tools to understand and plan responses to complex policy problems? Policy problems require policy solutions, and a strategy to achieve those ends. Unfortunately, much of the literature on project and policy failure is consumed by the immediate considerations of any given initiative. The focus and analysis frequently revolves around leadership, strategic planning, governance, and agency considerations. While these considerations are undoubtedly important, questions regarding strategic planning, or a lack thereof, are often superficial in nature. A coherent strategic plan, at its core, is a roadmap towards achieving a solution to a given policy problem. Not surprisingly, different types of policy problems require different roadmaps, or search solutions.

Returning to the question above, it is clear, in the opinion of this author, that policy scientists lack the requisite tools to create a successful strategic plan. First and foremost, a strategic plan must be matched, in a discriminating manner, to the nature of the policy problem. The first building block of successful strategic planning, therefore, is to understand the policy problem and determine how an organization, or government, ought to conduct a search solution. Without this critical first step and analysis, decision makers will invariably blindly follow a road map to policy failure or worse, fiasco.

RESEARCH PROJECT OUTLINE

The major objectives of this research project are twofold: first, to describe and analyze the development of EHRs in Ontario, in order to gain a more insightful understanding of this policy fiasco; and second, to construct an alternative approach of how government should organize a solution search to a given policy problem. Given the low success rate of government ICT projects in general, and failure to effectively develop EHR in Ontario specifically, new insights into this type of project failure must be brought to light. It is clear, to at least some degree, that policy scientists lack sufficient analytical tools to effectively understand how to organize large public ICT projects. It is a central argument of this author that government lacks both the framework and conceptual tools to undertake an effective policy solution search, and that much of failure in large, complex public ICT projects can be attributed to this fact. That is, at the outset of these projects, at the policy formulation stage, decision makers often get the requisite basic organizational structure wrong. Part of the task at hand, therefore, is to develop the necessary tools, or frameworks, to explain how to effectively conduct a policy search at the earliest stages of the policy cycle. Once this model is developed and articulated, it can be applied to a relevant case study, in this instance the development of EHRs in Ontario, to test its empirical validity and create a set of prescriptive recommendations to ensure that government ICT projects do not end in policy failure, or worse, as a policy fiasco.

This research project has thus both a theoretical and empirical component. The theoretical component involves reconsidering how government ought to conduct a policy solution search, by developing a framework that can suggest an appropriate organizational structure to best facilitate a solution search, given the specific nature of the policy problem. Moreover, this model must be able to incorporate and account for the realistic governance challenges that exist when managing any large government project. The empirical component of this research project involves applying the model to Ontario's EHRs project to gain a more nuanced understanding

of why this worthwhile initiative resulted in a policy fiasco. Taken together, the theoretical and empirical component of this research project will suggest new ways to improve the performance of government ICT projects in general, resulting in fewer policy fiascos, and hopefully, fewer policy failures. To this end, this research project is organized in the follow manner.

The second chapter of this research study lays the foundation for understanding ehealth systems. The chapter begins by defining ehealth, and seeks to explain the differences between Electronic Health Record (EHR) and Electronic Medical Record (EMR) systems. The chapter then goes on to briefly review some of the key benefits and drawbacks of ehealth systems, and the implementation experiences in jurisdictions outside of Ontario. Given the complexity of ehealth systems, and varied use of terminology within the field, it is important to create a common level of understanding that can be applied to our examination of the EHR project in Ontario.

The third chapter of this study is an examination of the EHR project in Ontario. It is designed to introduce the reader to evolution of the project, from the late 1990s until 2010, and is thus largely descriptive in nature. The objective here is to address four of the five W's (Who, What, Where, and When) in order to provide a common basis of understanding and lay out the facts. In effect, the first part of this chapter will tell the EHR story in Ontario. The second part of this chapter will review current interpretations of "why" the EHR project failed. Here, we will confine the review to the interpretations of Auditor General of Ontario and other select commentators.

The fourth chapter informs the theoretical component of this study, and develops a game theoretic framework to theorize about the implementation phase of the EHR project. As will be argued later, it is often helpful for decision makers to employ backwards induction when addressing technology problems. By thinking about implementation phase of a project first, decision makers can theorize about the nature of the solution that is required for any given problem, and then figure out how to tackle the problem. The framework developed in the chapter suggests that

there are two basic types of solutions: *independent* and *interdependent*. With this distinction in mind, the chapter reviews a highly simplified example of two organizations working to implement an EHR system. As the example demonstrates, *coordination* and *cooperation* amongst actors is critically important to develop an effective system when solutions are interdependent. The chapter concludes by reviewing how government can exercise authority to effectively ensure actors cooperate and coordinate on solutions during the implementation phase of a project.

The fifth chapter continues the theoretical component of this study, and is focused on the design phase of technology projects. Borrowing heavily from Nickerson and Zenger's model,²⁴ the chapter develops a coherent theoretical framework to think about technology problems, and how government should be organized to develop, or design, technology solutions. The framework begins with the problem as the basic unit of analysis, and argues that a problem's complexity dictates the optimal method of solution search, and critically, the optimal means of organizing that search. Unique to this framework is how organizational alternatives, or differing organizational structures, resolves the inherent conflicts over the selection of solution search trials. In the framework, organizational structures, or organizational alternatives, are matched in a discriminating manner to nature (or complexity) of a problem, based on the efficiency (or optimality) of discovering a solution to given problem. In more simplistic terms, the framework suggests how government should organize itself during the design phase of a technology project, given the strategy required to identify workable solutions to various types of problems.

The sixth chapter of this study expands on the Auditor General's report and popular commentary to gain a deeper understanding of why the Ontario EHR project resulted in a policy fiasco. We begin by briefly applying the policy lessons gleaned

²⁴ Jack A. Nickerson and Todd R. Zenger, "A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective," *Organization Science* 15, no. 6 (2004), 617-632.

from chapter two, on why similar ehealth projects have failed, to the Ontario initiative. With a relatively comprehensive understanding of conventional explanations on offer for the Ontario EHR failure, we then make use of the theoretical contributions of this study developed in chapters four and five to analyze the project. The objective here is to see whether the frameworks can provide any additional insights, or alternative explanations, for the project fiasco. By employing the frameworks, it will be argued that decision makers failed to place sufficient attention on the form of organization required to undertake the initiative at the outset of the project. Moreover, it will be argued that government decision makers inappropriately exerted their authority, and provided a set of incentives to actors in the healthcare system that effectively undermined the central goal of the EHR project. Hence, it will be argued that government decision makers got it wrong at the policy formulation stage of the policy cycle. Perhaps most importantly, this chapter will answer one of the fundamental questions: what ought to have been an effective strategic plan, and organizational structure, to effectively manage this complex ICT project?

The seventh and concluding chapter returns to issues raised earlier in the introduction of this study. The concern is that large government ICT projects, like the EHR initiative in Ontario, have often succumbed to policy failure. Given the high failure rate of government ICT projects, what lessons can be gleaned from the frameworks and the analysis in chapter six? How can government more effectively manage these challenging ICT policy problems? The aim here is to highlight a few key lessons that help practitioners handle large, complex ICT projects. With this in mind, we now turn our attention to understanding ehealth systems.

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Chapter Two

EHEALTH AND EHEALTH SYSTEMS

The primary objective of this chapter is to address the key concepts and terminology surrounding ehealth systems. As an emerging set of technologies, it is useful to establish a basic common understanding of what ehealth means, and what constitutes the critical components of ehealth systems, namely Electronic Medical Record (EMR) and Electronic Health Record (EHR) systems. Moreover, given our interest in the Ontario EHR project, it is useful to review some of key benefits and drawbacks of ehealth systems, and the experiences of jurisdictions outside of Ontario with respect to implementation.

DEFINING eHEALTH, EMRs & EHRs

ehealth is a neologism,²⁵ a newly coined term that is evolving and used to convey a variety of activities.²⁶ In a 2005 systemic study of the literature, Hans Oh and his

²⁵ Hans Oh and others, "What is eHealth?: A Systemic Review of Published Definitions," *Journal of Medical Internet Research* 41, no. 1 (2005), p. 32.

²⁶ Vincenzo Della Mea, "What is e-Health(2): The Death of Telemedicine?" *Journal of Medical Internet Research* 3, no. 2 (2001).

colleagues found that 51 unique definitions of ehealth were being used, of which the most frequently cited belonged to Gunther Eysenbach.²⁷ According to Eysenbach's definition:

e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.²⁸

While Eysenbach's definition of ehealth is certainly popular and helpful, it lacks the technical precision that is required for this study. In more practically applicable terms, and notwithstanding Eysenbach's definition, ehealth can be conceived of as a technical system, of which there are different levels of sophistication. The most important distinction, in terms of sophistication, occurs between Electronic Medical Records (EMRs) and Electronic Health Records (EHRs). An EMR is a

computerized health information system where providers record detailed encounter information such as patient demographics, encounter summaries, medical history, allergies, intolerances, and lab test histories. Some [EMRs] may support order entry, results management and decision support. Some [EMRs] may also contain features or be integrated with software that can schedule appointments, perform billing tasks, and generate reports. Providers use this system to record encounter, medical, or physician-specific information.²⁹

EMRs are generally geographically specific ehealth systems, which are used by a distinct provider of healthcare. With EMRs, healthcare providers are unable to communicate with one another, and their systems functionally operate in silos. On the other hand, an Electronic Health Record (EHR) is

²⁷ Oh and others, *What is eHealth?: A Systemic Review of Published Definitions*, pp. 32-39.

²⁸ G. Eysenbach, "What is e-Health?" *Journal of Medical Internet Research* 3, no. 2 (2001).

²⁹ D. A. Ludwick and John Doucette, "Adopting Electronic Medical Records in Primary Care: Lessons Learned from Health Information Systems Implementation Experience in Seven Countries," *International Journal of Medical Informatics* 78 (2009), p. 23.

a patient-orientated, aggregated longitudinal system of systems which assembles health information about a patient over a wide area network from, potentially, many geographically dispersed data sources. An EHR provides each individual with an aggregate, secure and private lifetime record of their key health history and care within the health system and shares encounter information available electronically with authorized health care providers and the individual anywhere, anytime in support of high quality care. It may draw on health information from sources such as EMRs, drug repositories, centralized lab data sources and other point-of-service applications over many encounters to assemble a complete health record about the patient. It is a patient centric document that may contain information from a broad range of providers other than family physicians, such as specialists, social workers, pharmacists, radiologists, dietitians, physiotherapists, and nurses.³⁰

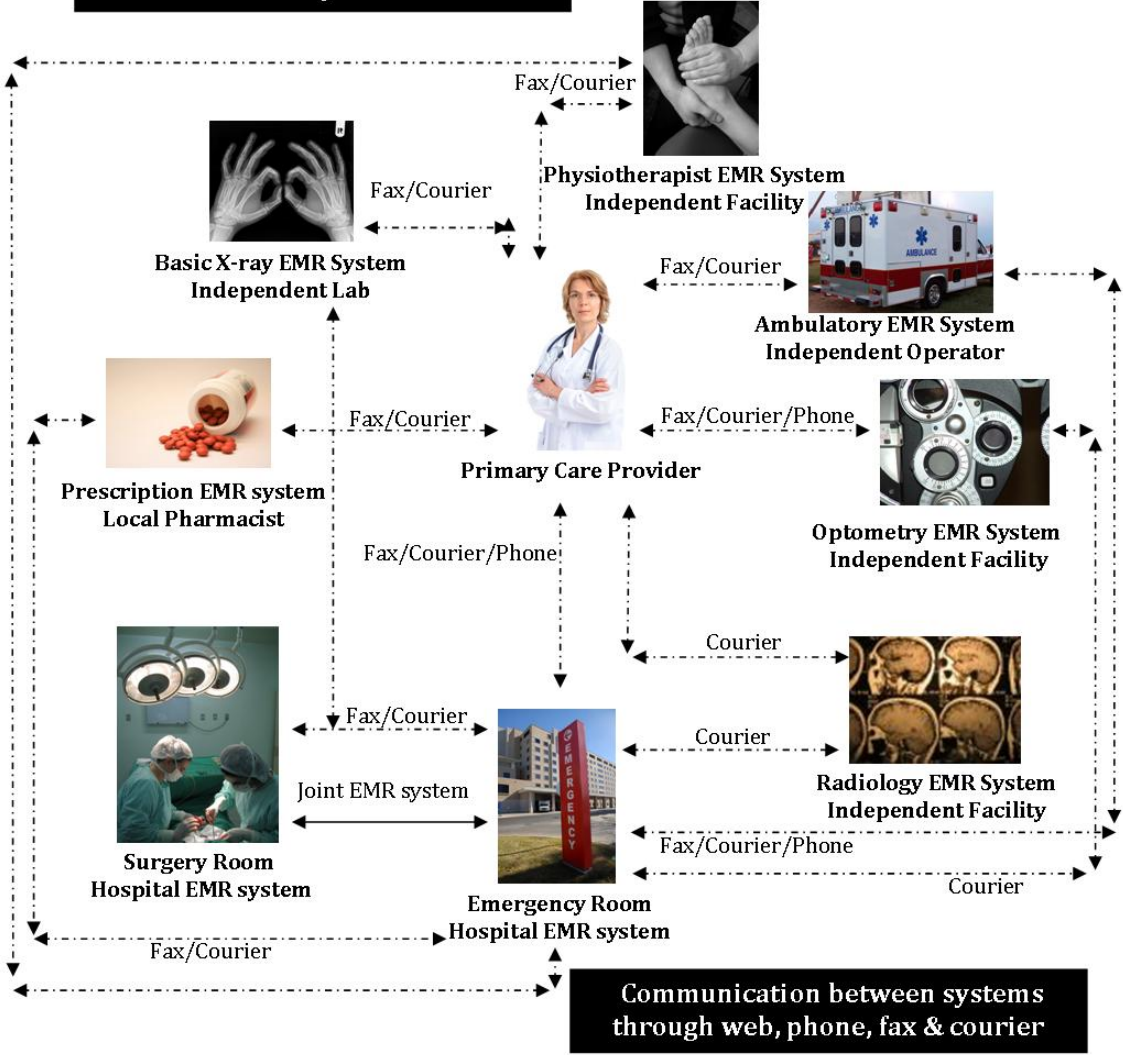
In terms of ehealth sophistication, EMR systems are the first rung of the ladder, while EHR systems are significantly more advanced. There are important distinctions between EMRs and EHRs. First, EMR systems are 'provider centric' while EHR systems are 'patient centric'. Second, while EMRs are geographically bounded, closed systems, EHRs work across large geographic areas, and are open access systems to anyone with appropriate clearance. Third, and finally, EHR systems are interoperable across multiple EMR systems.

The difference between EMR and EHR systems can be understood visually in Figures 1 and 2 (see following pages), respectively. In Figure 1, we have many different providers of healthcare using local EMR systems. Here, although there is some level of e-sophistication, the overall health system remains complicated, and functionally operates in silos; connections between different health providers continues to occur through phone, fax and courier. In Figure 2, we have a fully functional EHR system, in which all EMR systems are interconnected to a patient centric record. In Figure 2, for example, a patient could see a radiologist in location X, have their scans inputted directly to the EHR, and proceed to their family physician offices in location Y, to see and discuss the results.

³⁰ D. A. Ludwick and John Doucette, "Adopting Electronic Medical Records in Primary Care: Lessons Learned from Health Information Systems Implementation Experience in Seven Countries," *International Journal of Medical Informatics* 78 (2009), p. 24.

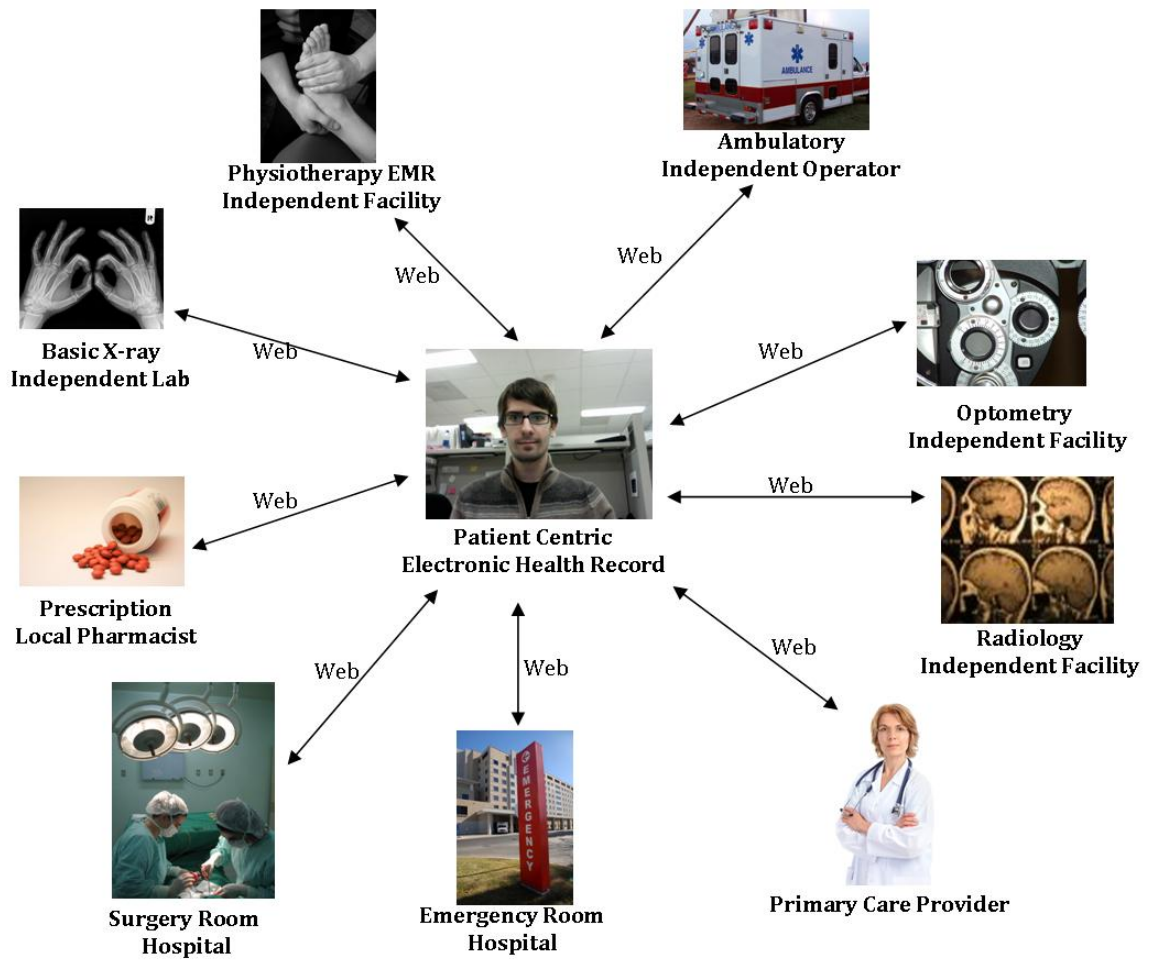
**Electronic Medical Record
EMR system**

Figure 1



**Electronic Health Record
EHR system**

Figure 2



**All communication from providers
accomplished through a secure network**

It is worth noting that the ultimate gold standard in ehealth is the interoperable electronic health record, or iEHR. While EHRs and iEHRs are similar, the distinguishing characteristic is the level of interoperability across organizational and political environments.³¹ iEHRs, in practical terms, are an endpoint in the evolution of ehealth systems. In the Canadian context, for example, we could envision an EHR system for all Ontarians, in which various providers (e.g. family physician, radiologist, pharmacist, etc.) can both input and output information with the system. Similarly, we could envision an EHR system for all Quebecers, with comparable capabilities for providers. The EHR systems in this example would become interoperable (hence, an iEHR) when a provider of healthcare in Ontario, treating a visiting patient from Montreal, could access and input/output information with the Quebec based system. The Holy Grail for ehealth, therefore, is not just an iEHR system for Canada, but rather a fully interconnected and interoperable global EHR system.

As Melinda Wilkins notes, “it is widely accepted that electronic health records are inevitable for the future of healthcare.”³² This is not a controversial statement. It is hard to argue that technology is not progressing and shaping all aspects of healthcare delivery. What is unexpected, perhaps, is the uniformly positive sentiment that ehealth invokes amongst public policy scholars and practitioners. Returning to the study on ehealth definitions, Hans Oh and his colleagues found that all 51 unique published definitions included positive connotations, including language such as benefits, improvement, efficiency and enabling. They go on to state “the overwhelming understanding of ehealth reflects an attitude of optimism.”³³ What is intriguing is that “*none* of the published definitions suggest that ehealth *may* have *any* adverse, negative, harmful, or disadvantageous effects.”^{34, 35} While we will

³¹ Patrick Powers, "Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study," *Healthcare Quarterly* 12, no. 1 (2008), pp. 120-123.

³² Melinda A. Wilkins, "Factors Influencing Acceptance of Electronic Health Records in Hospitals," *Perspectives in Health Information Management* Fall (2009), p. 5.

³³ Oh and others, *What is eHealth?: A Systemic Review of Published Definitions*, p. 36.

³⁴ The words in italics are this authors' emphasis.

review some of the challenges and unintended consequences of implementing ehealth systems in the field, it is critically important to emphasize the universally held, positive view, of those looking at ehealth in the abstract. In many ways, ehealth is viewed as a panacea.³⁶ It is argued that ehealth systems, and EHRs in particular, are the future of healthcare, with some going so far as to claim that it will allow “patients and professionals to do the previously impossible.”³⁷ It is with this in mind that we now turn our attention to some of the technical details in play, as we examine the benefits and drawbacks of ehealth systems.

BENEFITS OF IMPLEMENTING eHEALTH SYSTEMS

Health information and public policy experts intuitively sense that the implementation of standardized processes and interoperable ehealth systems are a positive development.³⁸ Advocates of ehealth systems can point to numerous benefits. Broadly, the benefits tend to include:^{39, 40}

- (1) improved care delivery through better access to medical information;
- (2) reducing the duplication and redundancy of tests and procedures;
- (3) the ability to diagnose patients more quickly and accurately;
- (4) reducing the number and severity of bureaucratic related medical errors;
- (5) improved ability to comply with patients’ wishes;

³⁵ Oh and others, *What is eHealth?: A Systemic Review of Published Definitions*, p. 38.

³⁶ David E. Trachtenbarg, "EHRs Fix Everything - and Nine Other Myths," *Family Practice Management* 13, no. 3 (2007), p. 26.

³⁷ Oh and others, *What is eHealth?: A Systemic Review of Published Definitions*, p. 38.

³⁸ Yaron Derman and others, "Saving Ontario Healthcare Dollars through E-Health Standardization: A Quantitative Study," *Electronic Healthcare* 7, no. 2 (2008), pp. 1-13.

³⁹ D. W. Bates and others, "A Randomized Trial of a Computer-Based Intervention of Reduced Utilization of Redundant Laboratory Tests," *American Journal of Medicine* 106, no. 2 (1999), pp. 144-50.

⁴⁰ K. A. Weant, A. M. Cook and J. A. Armistead, "Medication Error Reporting and Pharmacy Resident Experience during Implementation of Computerized Prescriber Order Entry," *American Journal of Health-System Pharmacy* 64, no. 5 (2007), pp. 526-30.

- (6) reduced medical stays, allowing patients to return home (or work) more quickly; and
- (7) improving medical management processes, through data and trend analysis.

Much of the literature on the benefits of ehealth systems focuses on improving access to, and use of, health information and the standardized processes that are developed to deploy this information in field. At the macro level, for example, the universal application of the World Health Organization's (WHO) International Classification of Diseases 10 (ICD-10) in EHR would allow improved global tracking of infectious disease, and likely improve the international response to global health threats. Similarly, the implementation of Logical Observations Identifiers Names and Codes (LOINC) and Systematized Nomenclature of Medicine – Clinical Terms (SNOWMED CT), some of the most well-known and used health informatics standards, creates a common set of descriptive language for physicians and health practitioners across geographic, organizational, and political boundaries.⁴¹ ehealth systems, broadly, facilitate the use common standards, which can improve patient care and improve health outcomes.

Standardization and improved access to information through ICT systems has proven successful in the healthcare field. Fortunately, with the deployment of ehealth systems beginning in the 1990s, we now have some data that can illustrate the benefits of ehealth implementation. By way of example, Brigham and Women's Hospital in Boston, Massachusetts saw a 55% drop in serious medication errors, and an 83% reduction in overall error rates, with the implementation of an ehealth system. Similarly, Ohio State University Medical Centre in Columbus Ohio, improved turnaround for pharmacy orders by two hours, while reducing overall pharmacy charges by \$910 per admission, while the Regenstrief Institute for Health Care,

⁴¹ Derman and others, *Saving Ontario Healthcare Dollars through E-Health Standardization: A Quantitative Study*, p. 2.

Indianapolis, Indiana, reduced average length of long-term stay by 0.9 days, while reducing hospital charges by 13%, all the result of newly established ehealth systems.⁴² The objective here is not to catalogue all the ehealth success stories, but rather to indicate that ehealth advocates are acting on more than faith and faith alone. The evidence suggests, in at least some cases, that ehealth systems do truly produce better health outcomes, more efficiently. It is also worth noting that ehealth systems can be procured efficiently. In Sweden, for example, an EHR system was developed and deployed in just one year, under budget, and with promising initial results.⁴³ The message, therefore, is that ehealth systems can be developed effectively and cost efficiently.

DRAWBACKS OF IMPLEMENTING eHEALTH SYSTEMS

In the mid 2000s, Randeree and Rao claimed that “the vision of online treatment and monitoring, 24-hour access to medical information,... electronic medical records, and online appointment scheduling has been fruitless.”⁴⁴ While this statement is certainly an exaggeration, the implementation of ehealth systems has been far from painless. Indeed, it appears that many of the concerns raised early in the implementation literature of ICT projects in general, remain applicable to ehealth systems today.⁴⁵ Many of the problems in ICT system implementation, across all fields, revolve around user resistance, system reliability (in technical terms), and organizational control.⁴⁶ What becomes implicitly clear throughout

⁴² M. J. Ball, D. E. Garets and T. J. Handler, "Leveraging Information Technology Towards Enhancing Patient Care and a Culture of Safety in the US," *Methods of Information in Medicine* 43, no. 5 (2003), pp. 503-508.

⁴³ John Ovretveit and others, "Improving Quality through Effective Implementation of Information Technology in Healthcare," *International Journal of Quality in Health Care* 19, no. 5 (2007), pp. 259-266.

⁴⁴ Ebrahim Randeree and H. R. Rao, "E-Health and Assurance: Curing Hospital Websites," *International Journal of Electronic Healthcare* 1, no. 1 (2004), p. 34.

⁴⁵ K. Lyytinen and R. Hirschheim, "Information Systems Failures: A Survey and Classification of the Empirical Literature," *Oxford Surveys in Information Technology* 4 (1987), pp. 257-309.

⁴⁶ R. Hirschheim and M. Newman, "Information Systems and User Resistance: Theory and Practice," *The Computer Journal* 31, no. 5 (1988), pp. 398-408.

much of the ehealth systems literature is that individuals matter. Far from being abstract technological constructs, ehealth systems have both a technological and human component, which must work in tandem in order for the overarching benefits to be realized.

There is significant concern amongst health policy experts regarding the use of new technology by practitioners in the field. As with any new system implementation, training is a prerequisite, and users require time to adapt to the technology.⁴⁷ This common concern, which is frequently raised, attempts to deal with the issue of user resistance. ehealth systems, by definition, interact with a varied group of individuals, who have different comfort levels with new technology. Early research on ICT implementation found that different individuals embrace new technology differently, with some users refusing to implement at all.⁴⁸ This early research on user implementation has been confirmed, to a large degree, with the introduction of ehealth systems. For example, recent studies looking at the implementation of EMR medication ordering systems,⁴⁹ and image ordering systems,⁵⁰ found that physician resistance led to reduced productivity, and overall medical office efficiency. Similarly, with the implementation of more comprehensive EHR systems, the data suggests that patient processing times might slow down, at least initially.⁵¹ The concerns of implementation and user resistance are not confined to productivity or efficiency. Not surprisingly, a number of studies have found that resistance to newly introduced ehealth systems has increased the number of medical errors,^{52, 53, 54, 55}

⁴⁷ Ball, Garets and Handler, *Leveraging Information Technology Towards Enhancing Patient Care and a Culture of Safety in the US*, pp. 503-508.

⁴⁸ J. Schmitt and K. Kozar, "Management's Role in Information System Development Failures: A Case Study," *MIS Quarterly* 2, no. 2 (1978), pp. 7-16.

⁴⁹ Claus Bossen, "Test the Artefact - Develop the Organization. the Implementation of an Electronic Medication Plan," *International Journal of Medical Informatics* 76, no. 1 (2007), pp. 13-21.

⁵⁰ David M. Schuster and others, "Involving Users in the Implementation of an Imaging Order Entry System," *Journal of the American Medical Informatics Association* 10, no. 4 (2003), pp. 315-321.

⁵¹ Ovretevit and others, *Improving Quality through Effective Implementation of Information Technology in Healthcare*, pp. 259-266.

⁵² Ross Koppel and others, "Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors," *JAMA - the Journal of the American Medical Association* 293, no. 10 (2005), pp. 1197-1203.

which have resulted in increased mortality rates.^{56, 57} To cite a Canadian example, the province of Alberta experienced a number of significant adverse medical events because of a lack of coordination in its EHR software operations. In 2004, and again in 2006, routine upgrades to the EHR system resulted in local Alberta health organizations making medical errors, illustrating the importance of effective human coordination and adaptation to technology change.⁵⁸

While the legitimate concern of user resistance and ehealth implementation should not be ignored, it is important to note that these are generally short term, negative, impacts.⁵⁹ There appears to be broad agreement that if clinicians and administrative staff are given sufficient training and time to adjust to new ehealth systems, implementation problems, and user resistance, will subside.⁶⁰ As a result of user resistance and coordination problems, many experts suggest a stage approach to introducing new ehealth systems. While the exact formulation for unveiling a new ehealth system vary by source, broad strategies in the literature tend to reappear; these include:^{61, 62, 63, 64, 65}

⁵³ Robert L. Wears and Marc Berg, "Computer Technology and Clinical Work," *JAMA - the Journal of the American Medical Association* 293, no. 10 (2005), pp. 1261-1263.

⁵⁴ Weant, Cook and Armiststead, *Medication Error Reporting and Pharmacy Resident Experience during Implementation of Computerized Prescriber Order Entry*, pp. 526-30.

⁵⁵ Tim Scott and others, "Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study," *BMJ - British Medical Journal* 331 (2003), pp. 1313-1316.

⁵⁶ Yong Y. Han and others, "Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order Entry System," *Pediatrics* 116, no. 6 (2005), pp. 1506-1512.

⁵⁷ E. Ammenwerth and others, "Impact of CPOE on Mortality Rates - Contradictory Findings, Important Messages," *Methods of Information in Medicine* 45 (2006), pp. 568-593.

⁵⁸ Dave A. Ludwick and John Doucette, "The Implementation of Operational Processes for the Alberta Electronic Health Record: Lessons for Electronic Medical Record Adoption in Primary Care," *Healthcare Quarterly* 12, no. 2 (2009), p. 104.

⁵⁹ J. R. Pilling, "Lessons Learned from a Whole Hospital PACS Installation. Picture Archiving and Communication System," *Clinical Radiology* 57, no. 9 (2002), pp. 784-788.

⁶⁰ Wears and Berg, *Computer Technology and Clinical Work*, pp. 1261-1263.

⁶¹ Schuster and others, *Involving Users in the Implementation of an Imaging Order Entry System*, pp. 315-321.

⁶² Pilling, *Lessons Learned from a Whole Hospital PACS Installation. Picture Archiving and Communication System*, pp. 784-788.

⁶³ Scott and others, *Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study*, pp. 1313-1316.

⁶⁴ Wears and Berg, *Computer Technology and Clinical Work*, pp. 1261-1263.

⁶⁵ Wilkins, *Factors Influencing Acceptance of Electronic Health Records in Hospitals*

- (1) indentifying key personnel to lead the transition;
- (2) creating a space of open dialogue amongst institutional users of the technology;
- (3) deploying a minimum of technology interfaces and minimizing system upgrades;
- (4) developing technology acceptance through gradual user use;
- (5) providing targeted training to relevant users;
- (6) allowing users space for technology feedback and improvement; and
- (7) slow and methodical deployment of ehealth systems in the workplace.

At the heart of all user resistance analysis, and the prescriptive solutions that follow, is the notion that healthcare actors are more than just intellectual abstractions. Healthcare actors are human, they are fallible, they are emotional, and they require time to adjust to new circumstances and electronic systems in their workplaces. Not surprisingly, ehealth users in the field will be reticent to change, and unsupportive of rapid technology change.

ehealth systems, by their nature, change the practice of healthcare delivery. As Ammenwerth and his colleagues have noted, ehealth systems change the way health organizations interact and communicate internally.⁶⁶ It is not uncommon, for example, for ehealth technology to redefine job responsibilities. With ehealth systems, physicians are often concerned that they absorb clerical duties, inputting medical orders directly into the new electronic interface system.⁶⁷ Changes, as a result of technology, create implementation challenges between clinicians and

⁶⁶ Ammenwerth and others, *Impact of CPOE on Mortality Rates - Contradictory Findings, Important Messages*, pp. 568-593.

⁶⁷ Schuster and others, *Involving Users in the Implementation of an Imaging Order Entry System*, pp. 315-321.

administrative staff that are difficult to overcome.⁶⁸ New ehealth systems often require the redefinition of clinical roles and responsibilities, which necessitate trade-offs between different employee groups during implementation.⁶⁹ The overarching challenge of ehealth implementation, therefore, is one of governance and organization. Self interested actors are both resistant to change, and protective of their established roles within the health system. While large surveys of healthcare workers have found a noticeable difference in perceived usefulness of ehealth systems between those that have adopted new technology and those who have not,⁷⁰ user and organizational resistance remains an ongoing challenge in the deployment of new technology in the healthcare field. The goal, therefore, is to get the technology right at the outset, in order to engender a climate of participation and acceptance.

There are a number of technical concerns with ehealth systems that deserve some brief attention. As with all software system that have a user interface, EHR systems can be limiting for healthcare professionals. For example, an EHR can be designed to include only discrete data input choices. A clinician treating a patient with eye pain might be faced with a YES/NO input choice on the EHR, and be unable to enter more appropriate information.⁷¹ Minimizing the type of the information that can be inputted through a standardized EHR can create serious medical problems. Ross Koppel and his colleague identified 22 potential causes of medical errors in a study of a relatively simple Physician Order Entry (POE) System. To illustrate the difficulty of creating an effective, albeit simple, EMR system, the authors noted that medical errors could occur for rather simple reasons, such as unclear “Log On/Log Off” procedures, through which information gets allocated to the wrong patient

⁶⁸ Wears and Berg, *Computer Technology and Clinical Work*, pp. 1261-1263.

⁶⁹ Scott and others, *Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study*, pp. 1313-1316.

⁷⁰ Wilkins, *Factors Influencing Acceptance of Electronic Health Records in Hospitals*

⁷¹ Trachtenbarg, *EHRs Fix Everything - and Nine Other Myths*, pp. 26-30.

record.^{72,73} In one of the few studies of fully implemented ehealth systems in a large and complex organizational setting, Tim Scott and his colleagues looked at the experience of Kaiser Permanente, the largest non-profit healthcare system in the United States with 8.2 million members, and how they implemented an EHR system. In this qualitative study, the authors found that software design choices created serious implementation problems for physicians, increased the number of medical errors, and resulted in an organizational perception that the ehealth system was fundamentally flawed.⁷⁴ The presentation of health information, a software design choice, has also raised concerns that EHRs can capture unnecessary data and result in information overload for physicians. This concern has led some to argue that the pen and paper record system, in which physicians have freedom to present information in the style of their choosing, can deliver superior care for patients.⁷⁵

The other chief technical concerns regarding ehealth systems revolve around interoperability and reliability. Interoperability with EMR systems is a serious concern. With the proliferation of EMR systems, and their multiple customized interfaces, physicians are rightly concerned that health information might be lost or unable to be used effectively. Without ehealth standardization, a patchwork of point-to-point EMR systems can decrease the capacity of physicians to access clinical notes, test results, and old procedures, resulting in increased delays and reduced patient care.⁷⁶ The reliability of ehealth systems in general is also a frequently cited concern of health professionals.⁷⁷ System crashes, for example, have resulted in the loss of patient data with serious repercussions. Without a real-time

⁷² Koppel and others, *Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors*, pp. 1197-1203.

⁷³ Health information being inputted into the wrong electronic patient record was a problem in Alberta, with the introduction of their EHR system. See: Ludwick and Doucette, *The Implementation of Operational Processes for the Alberta Electronic Health Record: Lessons for Electronic Medical Record Adoption in Primary Care*, pp. 103-107.

⁷⁴ Scott and others, *Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study*, pp. 1313-1316.

⁷⁵ Trachtenbarg, *EHRs Fix Everything - and Nine Other Myths*, pp. 26-30.

⁷⁶ Derman and others, *Saving Ontario Healthcare Dollars through E-Health Standardization: A Quantitative Study*, pp. 1-13.

⁷⁷ Trachtenbarg, *EHRs Fix Everything - and Nine Other Myths*, pp. 26-30.

backup, orders can be lost, and not reentered, until the system is restarted.⁷⁸ It is not difficult to envision a scenario where a system goes offline, and a treatment team in an Intensive Care Unit (ICU) would instantly become blind to the drugs that have already been prescribed to a patient. Therefore, while benefits of bringing healthcare into the digital age are certainly pronounced, public policy practitioners and health professionals must be mindful of the technical complications that may arise with the delivery of new ehealth systems.

GENERAL OBSERVATIONS

When observed in aggregate, it is clear that ehealth system implementation in general, and EHR projects in particular, have produced mixed results. While many public policy experts and politicians laude the benefits of these systems, the immediate evidence is less conclusive. There are certainly success stories, like those experienced the Karolinksa University Hospital system in Sweden,⁷⁹ and failures like those experienced by Kaiser Permanente in the United States.⁸⁰ Taking into consideration all of the evidence, two important points should be highlighted to ensure successful implementation of ehealth systems. First, getting the technology right, with standardization and interoperability across the given healthcare unit, is critical for success. Second, policy practitioners must be cognizant of the governance and administrative challenges that co-exist with the introduction of ehealth systems. Without planning for these challenges, and adopting the right implementation strategy, user resistance will grow and health outcomes will be compromised.

Despite the inherent challenges, and despite published failings, the promise of EHR systems should not be discounted. Through trial and error, and adaptation, the

⁷⁸ Koppel and others, *Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors*, pp. 1197-1203.

⁷⁹ Ovretveit and others, *Improving Quality through Effective Implementation of Information Technology in Healthcare*, pp. 259-266.

⁸⁰ Scott and others, *Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study*, pp. 1313-1316.

promised benefits of ehealth will be realized at some point in time. The challenge is to identify what works, and what doesn't. To learn from mistakes and evolve, while ensuring that public dollars are used in the most efficient way, with the best and most insightful processes that the available data and theory allows. It is with this mind that we now turn our attention to the Ontario healthcare system, and the EHR project.

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Chapter Three

THE ONTARIO EHR PROJECT

The EHR project in Ontario is one of the more interesting Canadian stories of policy fiasco, and forms the basis of this chapter. Few government initiatives in recent memory have sparked more anger and public resentment towards the political class. How did a worthwhile idea, the development of an EHR for all Ontarians, turn into what the *Toronto Star* coined the Frankenstein project?⁸¹ How were millions of dollars spent, without the government achieving its main objective? To understand the seminal event of Ontario's recent political history, we turn our attention to the EHR project, and the five Ws - Who, What, Where, When and Why.

THE HEALTHCARE SYSTEM IN ONTARIO AND THE IDEA OF EHRs

To tell the story of the EHR project in Ontario, it is necessary to understand the basic structure of the healthcare system. Authority and responsibility for the provision of

⁸¹ Tyler Hamilton, "Digital Health Slow to Boot Up; EXCLUSIVE Ontario's Push to Get Patient Records Online is Plagued with Bugs; Provincial Move to Electronic Records Running Year Behind; Few Benefits to show for Millions Spent, Critics Complain," *Toronto Star*, sec. A 01, November 21, 2005.

healthcare is largely vested in provinces, by virtue of the *British North American Act* (1867).⁸² Since the 1960s, Canada has operated a publically financed healthcare system known as Medicare. The system is primarily comprised of ten provincial and three territorial government health insurance plans, with the federal government providing insurance to a few distinct segments of society (for example, First Nations and the Canadian military). The provinces and territories plan, finance, and manage the healthcare system, providing insurance coverage for hospital care, physician and allied healthcare services, some drug costs and public health. The system is “national” in that the federal government assists in the financing of provincial and territorial plans, while all plans share an adherence to national healthcare principles, laid out in the federal *Canada Health Act*.⁸³ Therefore, while relatively similar levels of care are available to Canadians irrespective of geographic location, the governance models of the “system” are in effect creatures of provinces, and have unique organizational characteristics and structures.⁸⁴

The province of Ontario operates one the world’s largest publicly funded healthcare systems, which is ostensibly managed by the Ministry of Health and Long Term Care (MOHLTC).⁸⁵ In response to rising healthcare costs and budget constraints in the 1990s, public policy makers in Ontario started looking at new forms of integration and information technology as possible cost saving solutions. As early as 1996, a prominent think tank piece published by the Hospital Management Research Unit at the University of Toronto argued for a networked approach to organize healthcare, with ehealth systems taking centre stage.⁸⁶ In the late 1990s, the MOHLTC began

⁸² Donald J. Philippon and Jeffrey Braithwaite, "Health System Organization and Governance in Canada and Australia: A Comparison of Historical Developments, Recent Policy Changes and Future Implications," *Healthcare Policy* 4, no. 1 (2008), p. 169.

⁸³ Richard C. Alvarez, "The Promise of e-Health - a Canadian Perspective," *EHealth International* 1, no. 4 (2002), p. 1.

⁸⁴ Philippon and Braithwaite, *Health System Organization and Governance in Canada and Australia: A Comparison of Historical Developments, Recent Policy Changes and Future Implications*, p. 170.

⁸⁵ Margo C. Orchard and others, "Access to Electronic Health Records by Care Setting and Provider Type: Perceptions of Cancer Care in Ontario, Canada," *BMC Medical Informatics and Decision Making* 9, no. 38 (2009), p. 2.

⁸⁶ Kevin Mercer, "Examining the Impact of Health Information Networks on Health System Integration in Canada," *Leadership in Health Services* 14, no. 3 (2001), pp. 3, 4.

planning for the possible development of an EHR system for Ontario, with the adoption of the *Ontario Health Information Management Action Plan*.⁸⁷

The arguments in favour of developing an EHR system for the province were compelling. At a visceral level, patients in Ontario were tired of repeating health histories over and over again to different providers. They could not understand why, in the wired age, test results would take so long to get to their clinicians, or why when one hospital took a radiograph, it was unavailable at another hospital.⁸⁸ Public policy experts, with detailed knowledge of the health system, largely agreed that an EHR system could dramatically improve health outcomes, while reducing costs.⁸⁹ The ability to manage the large volume of patient information largely recorded in print and on film, was particularly attractive. Employing the accounting methods of Bliemel and Hassanein,⁹⁰ we can infer that there were roughly 1.3 billion pages of patient medical records archived across Ontario, which were often inaccessible when required. In a public healthcare system, where between \$0.25-\$0.40 of every dollar spent goes towards administration costs, improved information management was viewed as critically important to managing rising costs.⁹¹ While the estimates of savings from an EHR system in Ontario vary between \$1.1 billion⁹² to \$2.4 billion⁹³ annually, there was universal agreement that the introduction of EHRs would be a net positive for the province. Many of the most prominent healthcare organizations were strongly in favour of introducing EHRs,

⁸⁷ Jim McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, Toronto: Queen's Printer for Ontario, (2009), pp. 5, 47.

⁸⁸ Ken Tremblay, "In Conversation with Richard Alvarez," *Healthcare Quarterly* 13, no. 2 (2010), p. 25

⁸⁹ Nancy Gill, Kevin Leonard and Anthony Jonker, "Does E-Health Adoption Enable Improved Health Outcomes? Encouraging Evidence from Ontario Hospitals," *Healthcare Quarterly* 13, no. 3 (2010), pp. 50-56.

⁹⁰ Michael Bliemel and Khaled Hassanein, "E-Health: Applying Business Process Reengineering Principals to Healthcare in Canada," *International Journal of Electronic Business* 2, no. 6 (2004), p. 627.

⁹¹ *Ibid.*, p. 635.

⁹² Yaron Derman and others, "Saving Ontario Healthcare Dollars through E-Health Standardization: A Quantitative Study," *Electronic Healthcare* 7, no. 2 (2008), pp. 1-13.

⁹³ "Ontario's Plan for Electronic Health Records is at Risk, Official Says," *Canadian Medical Association Journal*, 2010, p. 253.

including the Canadian Medical Association, the Canadian Nurses Association, the Canada Pharmacists Association, the Canadian Healthcare Association and the Ontario Hospital Association.⁹⁴

COMMITTING TO AN EHR SYSTEM IN ONTARIOs – THE BEGINNING

In September 2000, the federal and provincial governments jointly agreed to develop an iEHR system. Similarly, the Ontario MOHLTC committed to developing a central, secure, and “private lifetime record of an individual’s health and care history, available electronically to authorized health providers.”⁹⁵ Hence, while the vision agreed to by all levels of government included an iEHR at the national level, the immediate goal for Ontario was an EHR for the province. The vision for Ontario in the early 2000s was a single, coherent, EHR system in which standardization and interoperability was paramount. At the outset, the province acknowledged that a non-standardized patchwork of point-to-point ehealth system integration would result in organizational chaos, and would be unable to deliver on the promise of EHRs.⁹⁶

In order to facilitate the adoption of EHR systems, the federal government created the Canada Health Infoway corporation (Infoway) in 2001, with the consent and support of the provinces. Although the federal government funds Infoway, it reports directly to all federal, provincial, and territorial deputy ministers of health.⁹⁷ The stated mission of Infoway is to foster and accelerate the development and adoption of EHR systems, with compatible technology standards on a pan-Canadian basis. In order to achieve this mission, Infoway has five stated objectives:

⁹⁴ Tremblay, *In Conversation with Richard Alvarez*, p. 26.

⁹⁵ Hugh MacLeod and others, "The Times they are A-Changing: What Worked and what we Learned in Deploying Ontario's Wait Time Information System," *Healthcare Quarterly* 12, no. Special Issue (2009), p. 13.

⁹⁶ Derman and others, *Saving Ontario Healthcare Dollars through E-Health Standardization: A Quantitative Study*, p. 2.

⁹⁷ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, pp. 1-48.

- (1) To accelerate the development and adoption of modern systems of health information and communication technologies;
- (2) To define and promote standards governing shared data to ensure the compatibility of health information networks;
- (3) To support the adoption of such standards for health information and compatible communications technologies for the health sector;
- (4) To enter into collaborative arrangements as required with governments of Canada, provinces and territories, corporations and not-for-profit organizations and other public and private partners for development and adoption of standards and technologies; and
- (5) To incorporate standards that protect personal privacy and confidentiality of individual records and security of health information.⁹⁸

In practical terms, Infoway acts as both a repository for best practices and technical guidance, as well as a federal funding conduit to support the development of EHR systems. In the classical bargaining approach to agenda setting, Infoway attempts to set the national direction for EHR systems through the power of the purse. To quote Richard Alvarez, the CEO of Infoway, "If a provinces' [EHR] priorities fall within Infoway's strategic direction and plans, we fund the initiative."⁹⁹ In practice, the history of Infoway suggests that it works both with, and around, the provinces, funding local health initiatives it deems worthy according to the criteria laid out above.

Ontario formally began developing a provincial EHR system in 2002. In order to complete the project as envisioned, the EHR system would require four fundamental components:

- (1) A secure network on which patient data could travel;

⁹⁸ Alvarez, *The Promise of e-Health - a Canadian Perspective*, p. 5.

⁹⁹ Tremblay, *In Conversation with Richard Alvarez*, p. 25.

- (2) Applications that enable users to record, store and retrieve patient data;
- (3) Patient data, including treatment history, test results, diagnostic images, and prescribed medications, in a digital form; and
- (4) Terminals or access points from which users can input and retrieve patient data.¹⁰⁰

At the outset of the EHR initiative, a strategic decision was made to separate the project into two distinct parts, which would be facilitated by two separate organizational units. The MOHLTC first created (2002) a separate body, the Smart Systems for Health Agency (SSHA), to oversee the creation of a secure electronic network and to connect the medical community to this network. SSHA was responsible, in effect, for the first and fourth components of the EHR system previously described. The MOHLTC itself, through the eHealth Program Branch, took over responsibility for the overall direction of the project, and specifically, for the clinical applications and associated databases that would run on the network. Therefore, in addition to its steering and oversight role, the MOHLTC was responsible for the development of the second component of the EHR system. Finally, realizing the third component of the system, the data, would be left to the direct providers of healthcare across the system.¹⁰¹ Employing an analogy to describe the Ontario EHR system, the network can be conceived of as a private highway that has a number of off ramps, or terminals, through which information can be accessed. Different types of transport vehicles, be it cars or trucks, represent the software programs travelling along the highway, while passengers represent the data. In this analogy, the SSHA was responsible for the highway and off ramps, the MOHLTC for the transport vehicles, and health providers for the passengers.

INITIAL TECHNICAL CHALLENGES FOR AN EHR SYSTEM IN ONTARIO

¹⁰⁰ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, pp. 1-48.

¹⁰¹ *Ibid.*, pp. 6-9.

The construction of a single EHR system for Ontario represented a large technical challenge for the province. Applying the Infoway methodology for Ontario,¹⁰² there were roughly 350 million healthcare transactions occurring every year in the province, including:

- 146 million laboratory tests
- 127 million prescriptions
- 110 million visits to physicians' offices
- 12 million diagnostics
- 1 million in-patient hospitalizations

In the early 2000s, there were already a number of distinct clinical IT solutions to aggregate at least some of the data produced every year by the healthcare system. A significant challenge was that parts of the system, doing the same task, could output data in different forms, making data aggregation difficult. Consider that an MRI machine purchased by hospital A, from company B, could output its scans in format C, while a similar hospital X, purchases a similar MRI machine from company Y, which outputs scans in format Z. Creating an EHR system which can take the input formats C and Z, and output the information in one consistent format, is not exceeding difficult. However, creating an EHR system that can accept thousands of different input formats becomes quite challenging, particularly when we consider the number of different legacy machines and codes that exist in one of the world's largest healthcare systems.¹⁰³

The overall challenge was accentuated by the lack of early action on an EHR system by the province. With an increased understanding of the promise of EHR systems in the 1990s, many local healthcare organizations were eager to get the technology in place as quickly as possible. It is not surprising then, that in the vacuum of action, units within the provincial healthcare system started building their own systems. To quote from a 2002 report by the Ontario Hospital eHealth Council,

¹⁰² McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 5.

¹⁰³ Patrick Powers, "Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study," *Healthcare Quarterly* 12, no. 1 (2008), pp. 120-123.

[An effective EHR system] needs standards to ensure the seamless transmission of information. Currently, there are several healthcare providers collecting patient information using different procedures, recording the information in different electronic formats, and using incompatible software. Even with a secure health information network [provided by SSHA]... providers will be unable to share information unless common standards are introduced."¹⁰⁴

The development of decentralized, non-standardized and incompatible local EMR systems, and small network EHR systems, was an early warning sign of potential problems for the development of a provincial EHR system. By way of example, early delays by the province resulted in the Sick Kids Hospital Network (SKHN) going alone and developing their own, unique, EHR system in 2002. The Child Health Network – Health Information Network (HiNet) aggregated clinical records from consenting parents of patients (under 18 years of age) exclusively from hospitals and pediatricians operating within the SKHN. Unfortunately, the HiNet system was incompatible with other ehealth systems in the province.¹⁰⁵

In the early days of the EHR project, and to ensure its eventual success, it was incumbent on MOHLTC to make one significant technology decision. In many ways, this decision was a binary choice. The MOHLTC could try and interface existing and ongoing EMR/EHR systems through a patient and clinical portal, or develop an entirely new system from scratch, while executing a “rip and replace” strategy of all legacy systems.¹⁰⁶ The first option represented a decentralized technology solution. As the Auditor General noted, this type of solution has the risk of engendering information silos, in which subsystems and applications are incapable of interacting, or being integrated, with related subsystems and applications. Moreover, the decentralized solution tends to encourage e-system duplication by different units within the healthcare system.¹⁰⁷ The benefits of the decentralization solution were

¹⁰⁴ Jeffrey Roy, "E-Health in Ontario: A Multi-Dimensional Governance Transformation," *International Journal of Healthcare Technology and Management* 8, no. 1/2 (2007), p. 69.

¹⁰⁵ Alvarez, *The Promise of e-Health - a Canadian Perspective*, p. 6.

¹⁰⁶ Powers, *Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study*, p. 123.

¹⁰⁷ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 16.

clear, in that existing systems could continue to evolve and operate as is, improving patient care in the short term. The latter option, the centralization approach, focuses on developing the technology capable of serving the widest number of uses, with the most consistent service and data access. With this option, the MOHLTC would discontinue funding for the development of localized EMR/EHR projects, while focusing on one true provincial EHR system. While the centralization solution was technically easier to achieve, the risk of development delays would result in no EHR system of any kind being available for patients.¹⁰⁸ Unfortunately for the EHR project, the MOHLTC neglected to make a decision, and continued to build its own provincial system, while simultaneously funding various competing local projects, exacerbating technical, financial, and governance problems. Given what would appear to be a binary technology choice, the government chose to pursue both avenues, despite the inherent contradiction of centralization vs. decentralization.

NEW GOVERNMENT, THE HEALTHCARE SYSTEM AND EHRs

Through the 1980s, existing healthcare governance models across Canada came under increased scrutiny. The centralized model of providing healthcare, in which the provincial ministry of health would contract directly with individual providers and hospitals, was increasingly viewed as outdated and ineffective. The prescriptive solution on offer was decentralization and regionalization. With these healthcare governance changes, experts argued that local integration of health services could be achieved along a wider continuum of care, improving health outcomes and allowing for increased local control.¹⁰⁹

By the late 1990s, the trend towards decentralization and regionalization had taken hold in all provinces, except Ontario. While there was some differentiation amongst

¹⁰⁸ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 16..

¹⁰⁹ Philippon and Braithwaite, *Health System Organization and Governance in Canada and Australia: A Comparison of Historical Developments, Recent Policy Changes and Future Implications*, p. 175.

provinces, the establishment of regional health boards allowed provincial health ministries to devolve authority and discretion in healthcare spending, while fostering the integration of health services along geographic lines. Politically, the devolution of healthcare governance authority was useful during the budget cutbacks of the 1990s, where responsibility for implementing cost-cutting measures were largely left to regional boards.¹¹⁰ Unlike the other Canadian provinces, the Ontario Progressive (PC) Conservative government led by Premiers Mike Harris (1995-2002) and Ernie Eves (2002-2003) chose a different path to managing the healthcare system. During their terms in office, the PC government chose to maintain the overarching structure of the healthcare system, while imposing changes from the political centre. During the eight years of PC rule, the government used a heavy-handed approach to slash healthcare budgets, while forcing hospital mergers (consolidation).¹¹¹ By 2003, and as a result of the choices made by the PC government, there were roughly 150 independent hospitals operating in Ontario, directly funded through the Ministry. Each hospital had its own CEO and independent board of directors.¹¹² Moreover, the government chose to maintain the direct funding relationship with pharmacies, mental health providers, rehabilitation facilities and physicians, which all operated independently of one another. There were some relatively minor changes to the governance of healthcare system, with the introduction of 43 Community Care Access Centres (CACCs) in 1997, responsible for purchasing community care and homecare services on behalf of patients in distinct geographic regions. Although the introduction of CACC could be viewed the first steps towards decentralization, legislation was introduced in 2001 gave the MOHLTC the power to appoint the Executive Directors and Boards of Directors of these organizations.¹¹³ When viewed in aggregate, there were relatively few changes to the system structure under the PC government. Day to day authority over the

¹¹⁰ Philippon and Braithwaite, *Health System Organization and Governance in Canada and Australia: A Comparison of Historical Developments, Recent Policy Changes and Future Implications*, p. 176.

¹¹¹ Roy, *E-Health in Ontario: A Multi-Dimensional Governance Transformation*, p. 73.

¹¹² David Reeleder and others, "Accountability Agreements in Ontario Hospitals: Are they Fair?" *Journal of Public Administration Research and Theory* 18 (2006), p. 163.

¹¹³ John Ronson, "Local Health Integration Networks: Will "made in Ontario" Work?" *Healthcare Quarterly* 9, no. 1 (2006), p. 48.

healthcare systems, both in *de facto* and *de jure* terms, resided at Queen's Park and with the MOHLTC. To a large extent, maintaining centralization was the name of the game between 1995-2003.

The October 2003 provincial election was a watershed political event. The Ontario Liberal Party, led by Dalton McGuinty, won the election and took office. The Liberal election platform focused heavily on healthcare reform, with the promise of increased funding, system integration, and delivery of a province wide EHR system. The McGuinty government also promised a new style of leadership and management, with a softer hand and increased community involvement. Both implicitly and explicitly, the direction of the healthcare system under the Liberals was positioned to contrast the approach of the former PC government.¹¹⁴ Given the promises made by the McGuinty government during the election, the Ontario government faced a daunting healthcare reform agenda, with major fiscal and bureaucratic repositioning at stake, on an accelerated timetable.¹¹⁵

In 2001, Kevin Mercer, then CEO of a CCAC, noted the difficulty of Ontario healthcare organizations embracing system-wide changes. The challenge, he argued, was that the system was a series of disconnected parts, or simply patchwork, with no unified direction. Many healthcare organizations, be they hospitals, primary care providers, or larger specialized units, like Cancer Care Ontario or the Sick Kids Network, operated in silos and were resistant to change.¹¹⁶ In 2005, health minister George Smitherman bluntly articulated the governance challenges of implementing any system-wide change:

If you look around Ontario, you can use the word 'system' all you want but we don't have one. Instead, medicare has become a chaotic jumble of disconnected services – hospitals, family doctor practices, community

¹¹⁴ Roy, *E-Health in Ontario: A Multi-Dimensional Governance Transformation*, 66-83.

¹¹⁵ Michael W. Fenn, "Reinvigorating Publicly Funded Medicare in Ontario: New Policy and Public Administration Techniques," *Canadian Public Administration* 49, no. 4 (2006), pp. 527-547.

¹¹⁶ Mercer, *Examining the Impact of Health Information Networks on Health System Integration in Canada*, pp. 1-30.

clinics, seniors' homes, drug stores, blood labs and home care, to name a few – all independently administered, frequently offering competing or duplicate services, and working in relative isolation from one another.¹¹⁷

After taking office, the Liberal government took the first steps towards reforming the healthcare system. In conventional Canadian public administration, a newly elected government achieves its agenda by enlisting the public service to elaborate specific policy options, and implement change. In practice, this is not always the case.¹¹⁸ In 2004, the Premier established the Health Results Team (HRT) to implement several system-wide transformative initiatives, with information management being a top priority. Through the HRT, the government first created the Ontario Health System Scorecard (OHSS), to link performance measures with overall strategy and integration. The OHSS had a nine themed Strategy Map, which evaluated healthcare organizations, and provided incentives to achieve government objectives (performance expectations), including the development of EHRs at the local level.¹¹⁹ Secondly and concurrently, the MOHLTC developed Hospital Accountability Agreements (HAA), which provided a mechanism for the government to ensure that public funding achieved desired performance and operational changes in hospitals. Separate agreements were reached with each hospital, and funding was, technically, tied to changes including the adoption of EHRs.¹²⁰ The OHSS and the HAA represent a form of organizational bargaining, in which central funding was used as an instrument to direct policy choices at the local organizational level. Therefore, in terms of developing an EHR system, the message from the MOHLTC to healthcare providers in 2004 was clear: start developing your own EHR systems.

¹¹⁷ Fenn, *Reinvigorating Publicly Funded Medicare in Ontario: New Policy and Public Administration Techniques*, p. 528.

¹¹⁸ *Ibid.*, p. 534.

¹¹⁹ Ali R. Tawfik-Shukor, Niek S. Klazinga and Onyebuchi A. Arah, "Comparing Health System Performance Assessment and Management Approaches in the Netherlands and Ontario, Canada," *BMC Health Services Research* 7, no. 25 (2007), pp. 1-4.

¹²⁰ Reeleder and others, *Accountability Agreements in Ontario Hospitals: Are they Fair?*, pp. 161-163.

While the message to healthcare providers, via the funding formula and accountability agreements, suggested a clear path for the development of an EHR system, other decisions muddied the waters. With an electoral promise to speed up the development of a province wide EHR system, the MOHLTC formally established (2004) an Office of E-Health, akin to a central policy unit/program unit. The Office was meant to guide development of EHRs across the province, while simultaneously developing the software required for a central system, leaving the SSHA to continue building the network infrastructure. To complicate matters, the Office of E-Health created a coordinating body for all EHR implementation efforts, called the Ontario e-Health Council, technically consisting of four separate councils with different areas of focus (continuing care, laboratories, physicians and hospitals). The new Office, and its offspring, represented the first organizational overhaul of the EHR project at the MOHLTC, just three years into the initiative. To complicate matters, the SSHA moved beyond its envisioned scope of responsibility, and spawned its own Ontario Health Information Standards Committee (OHISC) to try and facilitate integration of evolving EHR systems at the local level.¹²¹

In 2005, the first public warning signs emerged that the EHR project was in serious trouble. At the MOHLTC, the lack of a coherent strategy, and overlapping governance problems, led one insider to label the initiative a “widowed portfolio.”¹²² In the public realm, most the criticism was being leveled at the SSHA. Judy Middleton, Chief Information Officer with the William Osler Health Centre and an EHR project stakeholder, nicely sums up the popular sentiment at the time: “[the SSHA] keeps augmenting their staff, there’s no deliverables, and the salaries are far beyond what any corporate consultants make. It’s very discouraging. The money is

¹²¹ Roy, *E-Health in Ontario: A Multi-Dimensional Governance Transformation*, pp. 71, 72.

¹²² Hamilton, *Digital Health Slow to Boot Up; EXCLUSIVE Ontario's Push to Get Patient Records Online is Plagued with Bugs; Provincial Move to Electronic Records Running Year Behind; Few Benefits to show for Millions Spent, Critics Complain*

going into this hole but we're not seeing results."¹²³ According to the public narrative, the SSHA was failing the people of Ontario. As a result, in December 2005, Health Minister George Smitherman announced the first reorganization of the SSHA, with some internal staff changes and the appointment of six new members to the Board of Directors, to get the project back on track.¹²⁴

It is difficult to summarize the early developments of the EHRs project under the new Liberal administration precisely because multiple signals were being sent from different units at the centre of government. The publically articulated vision of the government was an integrated healthcare system with a province wide EHR system, with a commitment to maintain independent governance (independent Boards of Directors) for each institution and agency operating in the province.¹²⁵ In practical terms, one part of government at the MOHLTC was giving explicit direction and funding to local healthcare providers to develop EHR systems of their own. Another part of government, again at the MOHLTC, was developing a centralized EHR system independently of local healthcare organizations. Finally, a third arm of government, the SSHA, was building the provincial hardware network, while attempting to set its own software integration standards for use on that network.

Outside the structures of the provincial government, different units within the healthcare system started creating their own structures to help implement and develop EHRs. By way of example, the Ontario Hospital Association (OHA) created their own E-Health Council, with multiple working groups, to investigate how to

¹²³ Hamilton, *Digital Health Slow to Boot Up; EXCLUSIVE Ontario's Push to Get Patient Records Online is Plagued with Bugs; Provincial Move to Electronic Records Running Year Behind; Few Benefits to show for Millions Spent, Critics Complain*

¹²⁴ Tyler Hamilton, "Smitherman to Review e-Health Agency; Six New Board Members Nominated to Smart Systems Agency's Mandate to Create Electronic Health Record System," *Toronto Star*, sec. A 23, December 6, 2005.

¹²⁵ Ted Ball, Dennis Pointer and Liz Cole-Verlann, "Governance and Management Roles in Transforming and Integrating Independent Organizations within Interdependent Local Health Networks," *Law and Governance* 8, no. 1 (2004), pp. 4, 6.

develop their own EHR systems,¹²⁶ effectively undermining the centralized effort. In a similar vein, the SKHN¹²⁷ and Cancer Care Ontario¹²⁸ engaged in the development of their own systems, while Infoway, the Canadian Institutes for Health Research (CIHR), the Canadian Institute for Health Informatics (CIHI) were each acting as repositories of information, guidance and funding.¹²⁹

HEALTHCARE GOVERNANCE TRANSFORMATION AND THE LHIN

In 2006, in an attempt to foster increased health system integration, the Liberal government followed in the footsteps of its provincial cousins and adopted a decentralization and regionalization agenda.¹³⁰ With the introduction and passage of the Bill 36, the *Local Health Systems Integration Act*, the MOHLTC created a unique “made in Ontario plan” for healthcare governance.¹³¹ The government established 14 geographically based entities, called a Local Health Integration Network (LHIN), with roughly 500,000 inhabitants per zone. LHINs were established as non-profit corporations, responsible for the planning, integration and funding of local health services within their geographic areas of responsibility.¹³² The LHINs would have significant decision making powers, with the specific authority to make “integration decisions” - decisions that could order the transfer of services from one healthcare organization to another - and would be accountable to the provinces through formal accountability agreements.¹³³ The objective of regionalization through LHINs was to execute fundamental system-wide reform,

¹²⁶ Bliemel and Hassanein, *E-Health: Applying Business Process Reengineering Principals to Healthcare in Canada*, pp. 625-643.

¹²⁷ Alvarez, *The Promise of e-Health - a Canadian Perspective*

¹²⁸ Orchard and others, *Access to Electronic Health Records by Care Setting and Provider Type: Perceptions of Cancer Care in Ontario, Canada*

¹²⁹ MacLeod and others, *The Times they are A-Changing: What Worked and what we Learned in Deploying Ontario's Wait Time Information System*, pp. 10, 11.

¹³⁰ Sue Vanderbent, "Strategies for Transition Planning in Ontario's Local Health Integration Networks," *Healthcare Quarterly* 8, no. 3 (2005), pp. 78-82.

¹³¹ Ronson, *Local Health Integration Networks: Will "made in Ontario" Work?*, p. 46.

¹³² Tawfik-Shukor, Klazinga and Arah, *Comparing Health System Performance Assessment and Management Approaches in the Netherlands and Ontario, Canada*, pp. 4-9.

¹³³ Reeleder and others, *Accountability Agreements in Ontario Hospitals: Are they Fair?*, p. 163.

with the MOHLTC extracting itself from “daily hurly – burly of crisis management” and giving up its “traditional pre-eminent role” as the centre power in the provincial healthcare system.¹³⁴ The significance of the LHIN approach to healthcare, and the devolution of power away from the MOHLTC, can be judged by the budget allocation, with roughly \$20 billion of the \$33 billion/year health budget flowing through the regional organizations. Ostensibly, the MOHLTC would maintain some control over the LHINs through their power to appoint the Board or Directors, which in turn would select the CEO and management team.¹³⁵

The decentralization and regionalization agenda of the government was a “made in Ontario” plan precisely because it did not follow the traditional path of the other provinces. Despite the introduction of LHINs, the MOHLTC chose to omit certain parts of the healthcare system from the jurisdiction of these new organizations. To be specific, public health services, physician services, ambulatory services, laboratories and the provincial drug program were excluded from the mandate of LHINs.¹³⁶ To further complicate the governance arrangement, the MOHLTC made two rather curious decisions. First, the MOHLTC chose to reform the Community Care Access Corporations (CCACs), consolidating them from 42 to 14 entities along the same geographic lines as the LHINs.¹³⁷ The CCACs would continue to manage community care and purchase homecare services for patients from provider organizations, however they would have the power to select their own Boards of Directors and CEOs.¹³⁸ In effect, the MOHLTC created two parallel, geographically based, healthcare organizations with different areas of foci, with the intended outcome of fostering regional integration. The second curious decision by the MOHLTC was to maintain existing governance structure with respect to hospitals, which allowed them significant autonomy, despite the integration, funding and

¹³⁴ Fenn, *Reinvigorating Publicly Funded Medicare in Ontario: New Policy and Public Administration Techniques*, p. 538.

¹³⁵ Ronson, *Local Health Integration Networks: Will “made in Ontario” Work?*, p. 47.

¹³⁶ *Ibid.*, p. 47.

¹³⁷ Fenn, *Reinvigorating Publicly Funded Medicare in Ontario: New Policy and Public Administration Techniques*, p. 538.

¹³⁸ Ronson, *Local Health Integration Networks: Will “made in Ontario” Work?*, p. 46.

oversight powers of the LHINs. Hospitals, despite the governance transformation agenda, maintained independent Board of Directors, and the ability to appoint CEOs, resulting in a significant power base at the local level.¹³⁹

In terms of the EHR project, the regionalization agenda and the introduction of LHINs had a number of discernable impacts. First, and most importantly, there was no specific direction from the MOHLTC to LHINs regarding the development and deployment of information systems and information management tools. While no specific ‘marching orders’ were delivered, funding was made available to LHINs to create integrated information management systems at the regional level.¹⁴⁰ Once again, the government adopted a bargaining approach to governance, where incentives were enacted to achieve an overall policy direction. The other important impact of the regionalization agenda was the resulting complexity of the governance arrangement. The development of independent LHINs, CCACs, and relatively independent hospitals, created a complex governance structure, with decentralized authority vested throughout the healthcare system. While authority to make decisions and implement new systems moved away from the MOHLTC and the SSHA, the Office of E-Health continued to develop a centralized EHR system, laying the foundation for future implementation and governance challenges once the system was operational.¹⁴¹ As Jeffrey Roy, an expert on governance and ehealth in Ontario noted at the time, the overall impact of regionalization on the EHR agenda has simply “not been defined.”¹⁴²

CENTRAL EHR PROJECT PROBLEMS AND THE CREATION OF EHEALTH ONTARIO

¹³⁹ Roy, *E-Health in Ontario: A Multi-Dimensional Governance Transformation*, p. 73.

¹⁴⁰ Ronson, *Local Health Integration Networks: Will "made in Ontario" Work?*, p. 48.

¹⁴¹ *Ibid.*, p. 47.

¹⁴² Roy, *E-Health in Ontario: A Multi-Dimensional Governance Transformation*, p. 74.

Six years after the initial decision to undertake an EHR project for Ontario, and four years after the creation of the SSHA, little progress had been made on a centralized system. In 2010, Doug Tessier, Senior Vice-President of Development and Implementation at the agency responsible for implementing the governments' EHR strategy, reflected on early efforts at the MOHLTC. Tessier argued that there were consistent delays in making key political decisions, starting in 2000. Decisions within the MOHLTC were taking up two years, while legislation to enable a provincial EHR system failed to materialize.¹⁴³ Recall that the MOHLTC was responsible for the software end of the EHR system, and had established the Office of E-Health in 2004 to coordinate the efforts in the first reorganization of the project. Between 2004 and 2007, the MOHLTC invested approximately \$100 million to develop the EHR software. With no strategic plan, the Office made little discernable progress, with the medical community unable to use even a skeleton EHR system.¹⁴⁴ As Jim McCarter, Ontario's Auditor General noted, the MOHLTC at the time relied heavily on consultants to both develop and manage the project, all without proper oversight.¹⁴⁵

At the other end of the EHR project, the SSHA continued to build the network infrastructure. Throughout its tenure, the SSHA continuously over promised and under delivered. With the reorganization of December 2005 complete, the Chair of the SSHA publically assured Ontarians in 2006 that EHRs would be available by the end of the year, with a fully functional system in place by 2010.¹⁴⁶ However, this promise failed to materialize, and new problems emerged. A 2007 report on the SSHA by Deloitte Consulting questioned the efficacy of its spending, and argued for a new, aggressive, turn around strategy.¹⁴⁷ Between 2004 and early 2007, the SSHA

¹⁴³ *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, p. 253-254.

¹⁴⁴ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 10.

¹⁴⁵ *Ibid.*, p. 11.

¹⁴⁶ Tyler Hamilton, "\$125m Needed to Speed e-Health; Electronic Record Keeping could in Place Next Year, Agency Says. would Build on Success of Child Health Network's Computerized Files," *Toronto Star*, sec. A 09, September 23, 2006.

¹⁴⁷ Staff Reporter, "Bring Medical Records into the Wired World," *Toronto Star*, sec. A 14, January 4, 2007.

spent \$400 million building the information highway, and developing the capacity to connect the medical community to it.¹⁴⁸ As a Crown agency, the SSHA was operating in a more arm's-length capacity, and had developed a difficult relationship with the MOHLTC, one "marred by mutual mistrust and confusion over roles and responsibilities."¹⁴⁹ Like the Office of eHealth, the SSHA relied heavily on external consultants, without proper controls and procedures in place.¹⁵⁰ For much of the medical community, the SSHA was viewed as a disappointment for its failure to deliver a workable EHR system.¹⁵¹ Although the SSHA was publically taking much of the blame, the development of the network infrastructure was one of few pieces of the project that was making progress. Returning to our analogy, by 2007 the SSHA was relatively successful in building the highway, albeit at an inflated cost. The problem was the lack of software, of transport vehicles, to operate on the highway. In 2007, the SSHA was spending \$2.5 million per month to maintain the workable network, which was functionally inactive.¹⁵²

In 2007, the Liberal government of Dalton McGuinty was re-elected with a second majority mandate. Once again, getting an EHR system operational was front and center of the governments' agenda. Throughout the medical community, and at the MOHLTC, it was clear that the EHR project was not delivering as promised. In 2007, a number of new and important decisions were made. First, the government decided to undertake a second reorganization of the project at the MOHLTC, supplanting the Office of e-Health with a new internal eHealth Programs Branch. With new leadership and focus, it was hoped that the Ministry would be able to make some progress towards developing the requisite software system for the EHR project,¹⁵³ while the SSHA was left to augment and maintain the network infrastructure. Second, the MOHLTC started investigating new avenues to get the software end of

¹⁴⁸ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 9.

¹⁴⁹ *Ibid.*, p. 9.

¹⁵⁰ *Ibid.*, p. 11.

¹⁵¹ Ronson, *Local Health Integration Networks: Will "made in Ontario" Work?*, p. 48.

¹⁵² McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 11.

¹⁵³ *Ibid.*, p. 11.

the system working. A draft strategy was developed to borrow and expand the existing EHR system used by the Hospital[s] for Sick Children. According to the draft strategy, by using and modifying the electronic Child Health Network (eCHN), formally HiNet,¹⁵⁴ the province could have a workable, central, and fully interoperable EHR system in place by 2010, and accessible throughout the primary care system by 2011-2012.¹⁵⁵

The draft strategy to adopt the eCHN province wide, disregarding all previous software development work from 2000 to early 2007, serves to illustrate the lack of central progress made on the EHR project, and the dearth of effective coordination across the province. The strategy also illustrates how regionalization was one of the biggest problems towards the creation of a centralized system, with SSHA and the MOHLTC having to coordinate through multiple organizations and political power centers.¹⁵⁶ At the local level, standalone EMR and EHR system were proliferating, funded by the MOHLTC and Infoway, and unable to communicate with one another. John Ronson wrote in 2006 that the track record of Ontario's hospitals voluntarily integrating the ehealth systems was weak.¹⁵⁷ Between 2006 and 2008, a large study of Ontario's hospitals on EHR implementation found that while health outcomes improved where these system were in place, uptake was uneven, both at the institutional and user level.¹⁵⁸ When viewed in aggregate, the Ontario EHR project was spiraling out of control, and the adoption of the eCHN system was one viable option to get the project back on track.

¹⁵⁴ Powers, *Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study*, pp. 120-123.

¹⁵⁵ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 18.

¹⁵⁶ Powers, *Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study*, 120-123.

¹⁵⁷ Ronson, *Local Health Integration Networks: Will "made in Ontario" Work?*, p. 48.

¹⁵⁸ Gill, Leonard and Jonker, *Does E-Health Adoption Enable Improved Health Outcomes? Encouraging Evidence from Ontario Hospitals*, p. 51.

For reasons unexplained, the eCHN adoption plan was never approved.¹⁵⁹ Moreover, alternative options, like adopting and modifying the systems from Cancer Care Ontario or the Cardiac Care Network,¹⁶⁰ were not pursued. Curiously, the eHealth Programs Branch charted a new course, and decided to create yet another new system, the Wait Time Information System (WTIS). The WTIS was primarily designed to improve wait time across the province. However, through the creation of a Client Registry/Enterprise Master Patient Index that would store and link patient information, the MOHLTC believed that the WTIS would ultimately become the cornerstone, once reconfigured, of a provincial EHR system.¹⁶¹ The challenge with the WTIS strategy was not merely technological, but organizational, to develop a working ehealth system and to get the varied actors within the healthcare system to adopt the technology. To illustrate the coordination challenges, consider that the WTIS required bringing together the key stakeholders for the new initiative, including the MOHLTC, the SSHA, LHINs, CCACs, individual hospitals, and from the federal side, Infoway and the Canadian Institute of Health Informatics. As the leaders of the WTIS project noted, they found themselves “competing for priority with its stakeholders at the hospitals, LHINs and the Ministry.”¹⁶² To secure compliance with the project, a bargaining and coercive governance approach was adopted, with special funding allocated through funding envelopes to hospitals for the WTIS strategy, and performance and implementation assured through Hospital Accountability Agreements.¹⁶³ The WTIS was successful, insofar that it was developed quickly and was at least partly responsible for reducing wait times across the province. However, there is no evidence that local healthcare organizations chose to stop the development of their own local EMR and EHR systems, with the

¹⁵⁹ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 18.

¹⁶⁰ Orchard and others, *Access to Electronic Health Records by Care Setting and Provider Type: Perceptions of Cancer Care in Ontario, Canada*

¹⁶¹ MacLeod and others, *The Times they are A-Changing: What Worked and what we Learned in Deploying Ontario's Wait Time Information System*, pp. 9-11.

¹⁶² MacLeod and others, *The Times they are A-Changing: What Worked and what we Learned in Deploying Ontario's Wait Time Information System*, p. 10.

¹⁶³ *Ibid.*, pp. 9-12.

belief that the WTIS would be transformed into a central, province wide, EHR system.

In a June 2008 cabinet shuffle, David Caplan was appointed Minister of Health and Long-Term Care, taking over the portfolio from George Smitherman. By that time, the EHR project was seriously out of control. Between 2007-2008, the SSHA agency continued its practice of improper outsourcing and contracting, spending roughly \$200 million dollars to continue building and maintaining the network.¹⁶⁴ The problems experienced by the Office of e-Health continued at the newly constituted eHealth Programs Branch, albeit on a larger scale. By 2008, the Branch was engaging more than 300 external consultants compared to fewer than 30 full-time ministry employees, and the practice of sole sourcing contracts while failing to adhere to established procedure continued.¹⁶⁵ Most disappointingly, eight years after committing the province to develop a central EHR system, the government did not have a strategic plan in place to achieve the objective, and had still not developed the requisite software to make the system functional. Fragmentation across the healthcare system was resulting in poor coordination, and key stakeholders, particular those involved with the EHR project, realized that something had to change.¹⁶⁶ Therefore, despite being the champion of regionalization and decentralization in the healthcare system, the Liberal government under the new Minister, David Caplan, chose to implement an EHR centralization agenda.

In the fall of 2008, the government implemented a fourth reorganization of the EHR project, with the creation of eHealth Ontario, a new central agency.¹⁶⁷ eHealth Ontario took over both the SSHA and Ministry's own EHR initiatives, with a mandate

¹⁶⁴ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 27.

¹⁶⁵ *Ibid.*, p. 11.

¹⁶⁶ Orchard and others, *Access to Electronic Health Records by Care Setting and Provider Type: Perceptions of Cancer Care in Ontario, Canada*, p. 9.

¹⁶⁷ Powers, *Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study*, 120-123.

to have an EHR in place for Ontarians by 2015,¹⁶⁸ effectively pushing back the deadline by five years. Sara Kramer, who previously headed the WTIS initiative was appointed CEO of the eHealth Ontario, while Allan Hudson was appointed Chair of Board of Directors. As Davis noted back in 2004, “governments can devolve authority for healthcare, but they cannot devolve responsibility.”¹⁶⁹ For the first time, the province had one focal point for development and management of the EHR project, and one organization that was ultimately responsible. By locating authority for the entirety of the project in eHealth Ontario, the government followed in the centralizing footsteps of Prince Edward Island¹⁷⁰ and Alberta.¹⁷¹ Like other public ICT projects,¹⁷² the EHR project had increasingly become a governance problem, where both knowledge and power were distributed throughout the system. Centralization, it was hoped, would deliver results, promptly and efficiently.

EHEALTH ONTARIO FAILURES, THE ENSUING SCANDAL AND THE AFTERMATH

The most authoritative account of the EHR project, as previously mentioned, was the Special Report issued by Ontario Auditor General Jim McCarter in October 2009. While the report focused primarily on the contracting aspects of the project, and the value-for-money achieved by the SSHA, the MOHLTC, and eHealth Ontario, McCarter went to some lengths to provide context to challenges facing the EHR initiative. At the outset, eHealth Ontario was playing catch up. As McCarter noted:

The CEO of the eHealth Ontario agency [Sarah Kramer] was appointed in 2008 and reportedly told that there were serious problems with the

¹⁶⁸ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 19.

¹⁶⁹ J. Davis, "Let Regionalization Continue to Evolve," *Healthcare Papers* 5, no. 1 (2004), p. 50.

¹⁷⁰ Philippon and Braithwaite, *Health System Organization and Governance in Canada and Australia: A Comparison of Historical Developments, Recent Policy Changes and Future Implications*, p. 178.

¹⁷¹ D. A. Ludwick and John Doucette, "Adopting Electronic Medical Records in Primary Care: Lessons Learned from Health Information Systems Implementation Experience in Seven Countries," *International Journal of Medical Informatics* 78 (2009), 23-31.

¹⁷² Barbara Ann Allen and others, "E-Governance & Government Online in Canada: Partnerships, People & Prospects," *Government Information Quarterly* 18, no. 2 (2001), 93-104.

eHealth agenda and that overcoming these problems required urgent action. She wanted to build her own team – people she had worked with in the past or whom she personally recruited – rather than rely on ministry or SSHA staff or their consultants. The CEO felt she had the implied, if not the formal, authority to do whatever was necessary to get the job done. If this meant personally selecting the firms and individual consultants that she wanted, so be it.¹⁷³

With the transition to a new agency, little work was accomplished between October 2008 and June 2009, as multiple projects were put on hold and CEO Sarah Kramer charted yet another new course for the EHR project.¹⁷⁴ Kramer immediately focused eHealth Ontario on a few “quick-win” projects, including a diabetes management system, a medical management system, and a medication management system.¹⁷⁵ Like the WTIS strategy, which it was hoped could evolve into a central EHR system for the province, eHealth Ontario banked on the diabetes system. According to the MOHLTC, “achieving an EHRs for diabetes patients will provide a foundation for achieving EHRs for patients with chronic diseases. From there, EHRs can be extended to all Ontarians.”¹⁷⁶ In his audit McCarter expressed surprise with the MOHLTC and eHealth Ontario “de-emphasizing” the EHR objective and questioned how the new plan would enable “the agency to deliver a fully functional EHR for all Ontarians by 2015.”¹⁷⁷ Despite this obvious concern, eHealth Ontario ramped up spending to make it a reality.

By 2008, eHealth Ontario was spending \$6 million/month to maintain the network infrastructure previously under the domain of the SSHA, despite it being severely under used.¹⁷⁸ With its focus on the new “quick win” projects, Kramer immediately began awarding multi-million dollar contracts without an open and competitive process, and adopted questionable procurement practices. Summarizing the operating culture at eHealth Ontario, the Auditor wrote:

¹⁷³ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 12.

¹⁷⁴ *Ibid.*, p. 10.

¹⁷⁵ *Ibid.*, p. 8.

¹⁷⁶ *Ibid.*, p. 20.

¹⁷⁷ *Ibid.*, p. 20.

¹⁷⁸ *Ibid.*, p. 9.

To sum up, too many procurements at the eHealth Ontario agency and, to a lesser extent, at the Ministry's eHealth Programs Branch and at SSHA were the product of rushed decision making; the acceptance of expediency over thoroughness; the routine defence that the work was of an emergency and therefore justified the bypassing of normal procurement controls; procedural shortcuts; absent, or contradictory documentation; and, of particular concern, the concentration of decision-making power in the hands of a few individuals with no compensating controls to ensure their decisions were appropriate. Sound and all reasonable policies were in place to ensure that all suppliers could fairly compete for government business and that tax dollars would be prudently spend, but all too often the rules were not followed.¹⁷⁹

While CEO Sarah Kramer and Chair of the Board, Allan Hudson, were given *carte blanche* to get projects moving forward, scandals started to emerge at eHealth Ontario. In April 2009, Kramer became the source of public indignation when a story broke that she spent \$51,000 redecorating her private office.¹⁸⁰ A month later, a *Toronto Star* investigation found an eHealth Ontario consultant billing \$2,750/day plus expenses for his advice, for a net cost of \$61,875 for 22.5 days of work.¹⁸¹ Once the bad headlines started, they kept on coming. In June, it publically emerged that the Premier's former chief of staff and health advisor were both consulting for eHealth Ontario, charging over \$300/hour to discuss communication strategies for the embattled agency.¹⁸² Another headline publically roasted Kramer for hiring five consultants to draft a 3,356 word speech at a cost of \$25,001, and another six consultants to draft a 3,319 word speech at a cost of \$24,675.¹⁸³ Besieged by scandal, and with no progress towards a workable EHR, the project had evolved into a full-fledged policy fiasco.

¹⁷⁹ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 13..

¹⁸⁰ Tanya Talaga, "Critics Roast Government Over \$647M Boondoggle; Ontario's Abandoned Medical e-Records Plan Called a Waste of Cash," *Toronto Star*, sec. A 01, August 8, 2009.

¹⁸¹ Tanya Talaga, "Health Agency Paid Consultants \$2,750 a Day, Documents show; CEO of eHealth Ontario also Got Six-Figure Bonus," *Toronto Star*, sec. A 06, May 29, 2009.

¹⁸² Tanya Talaga, "EHealth Scandal Reaches Premier's Inner Circle," *Toronto Star*, sec. A 01, June 11, 2009.

¹⁸³ Tanya Talaga, "1 Speech 5 Consultants 3,356 Words the Cost to You \$25,001; 1 Speech, 6 Consultants, 3,319 Words \$24,675.28," *Toronto Star*, sec. A 01, August 8, 2009.

The ultimate result of the central EHR project, and hence activities undertaken in various forms by the MOHLTC, the SSHA, and eHealth Ontario, was roughly \$1 billion in spending between 2002 and 2009 with few results. As the Auditor General wrote in his report, “the value of this investment, at least to date, has not been realized.”¹⁸⁴ The immediate fallout of the Auditor’s Report was the resignation of eHealth Ontario CEO Sarah Kramer, Board Chair Allan Hudson, Health Minister David Caplan and the Deputy Minister of Health, Ron Sapsford. Moreover, the EHR project was once again put on hold, with a fifth reorganization required as the result of the top management team resigning from eHealth Ontario.¹⁸⁵

In 2010, Richard Alvarez, CEO of Infoway, noted that the “name of the game is not technology. The name of the game is change management.”¹⁸⁶ Alvarez is at least partially correct. While technology questions are certainly important parts of the equation, equally important are questions of governance and compliance. By 2010, ten years after committing to a provincial EHR system, eight years after work had begun, and \$1 billion spent, there was no working centralized system. As Nancy Gill noted, the EHR project experienced a “reduced pace of change,” while the scandals drove “funders, innovators and change champions to other projects.”¹⁸⁷

There is no question that the Ontario EHR initiative is a project fiasco. The question is: what now? While the central authorities, the MOHLTC, the SSHA and eHealth Ontario dithered and wasted significant resources, local units within the healthcare system have worked hard to develop their own EMR and EHR systems. During this review of the EHR project, we have briefly mentioned some of the local initiatives, like those undertaken by the SKHN (the eCHN), between 2000 and 2010. According to a recent analysis by the Canadian Medical Association (CMA), there are now at least 20 different EHR systems operating in Ontario, across different LHINs,

¹⁸⁴ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 9.

¹⁸⁵ *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, 253-254.

¹⁸⁶ Tremblay, *In Conversation with Richard Alvarez*, p. 26.

¹⁸⁷ Gill, Leonard and Jonker, *Does E-Health Adoption Enable Improved Health Outcomes? Encouraging Evidence from Ontario Hospitals*, pp. 50, 51.

specialized agencies, and hospital networks. Moreover, the cost of the developing just one of these systems is upwards of \$100 million. At the outset of the provincial initiative, the government noted the necessity of a central system to ensure interoperability. However, as the CMA notes, “integrating those [20] systems is problematic as many are incompatible,” while certain health organizations have used off-the-shelf products that can not integrated because of commercial competition considerations between system vendors.¹⁸⁸ With the completion of the EHR story in Ontario between 2000 and 2010, the problems of governance and technology choice have come full circle. Once again, the province of Ontario is at a crossroads. Millions of dollars have been spent on a centralized system with few deliverables, while millions more have been spent on ehealth systems that functionally operate in silos. At question, as the next decades unfolds, is whether the provincial government will redouble its efforts, ultimately adopting a rip-and-replace strategy, or whether the healthcare system will continue to operate in an uncoordinated manner, befitting its current governance structure.

¹⁸⁸ *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, p. 254.

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Chapter Four

A FRAMEWORK FOR THE IMPLEMENTATION PHASE

In the preceding chapter, we reviewed the Ontario EHR project. It is clear that this project had two distinct components: a design phase and an implementation phase. The design phase involved developing a solution, an EHR system, to the problem of managing vast amounts of patient information. The implementation phase, on the other hand, involved various actors at all levels of the healthcare system trying to adopt technological solutions. A few interesting points worthy of further investigation emerge from this story of policy fiasco.

The first interesting feature of this project was the decentralized approach adopted by the province to achieve the goal of an EHR system that was interoperable across the province.¹⁸⁹ While the political centre, the MOHLTC, suggested that it was developing one coherent system, it simultaneously funded the development of local EHR and EMR projects across the province. Hence, during the design phase of the project, there were a host of actors developing their own unique solutions to the

¹⁸⁹ Yaron Derman and others, "Saving Ontario Healthcare Dollars through E-Health Standardization: A Quantitative Study," *Electronic Healthcare* 7, no. 2 (2008), p. 2.

patient information management problem. The first question, therefore, is whether a decentralized, or independent, approach is appropriate for solving this type of EHR problem. The second interesting feature of this project is the implication of independent actors implementing their own solutions. What are the advantages and disadvantages for the healthcare system of this decentralized implementation approach?

There is obviously a relationship between the design phase and the implementation phase of an ICT project. It is only natural for government to think of these projects in linear terms: (1) how should one design a solution; and (2) how should one implement the solution. However, it is often useful to think about implementation first. By using backwards induction, decision makers can first theorize about the nature of the solution that is required for any given problem, and then figure out how to best tackle the problem.¹⁹⁰ As this chapter will demonstrate, all solutions are not created equal. For government, different types of solutions require different policy responses.

In the first part of this chapter, we develop a game theoretic framework to examine the two basic types of solutions: *independent* and *interdependent*. With this basic distinction in mind, we turn our attention to a highly simplified example of two organizations working to implement EHR systems. As we will demonstrate, even in a highly simplified example, *coordination* and *cooperation* amongst actors is critically important to develop an effective EHR system. In the second part of this chapter, we add to the framework and examine how government can use its authority to effectively coordinate and/or cooperate on solutions. We argue that government can exercise its authority through the use of *persuasion*, *incentives*, or *rules*. Further, we argue that the use of authority must be matched in a logical and discriminating manner to the nature of interdependent solutions. Finally, we briefly

¹⁹⁰ See, for example: Robert Gibbons, *Game Theory for Applied Economists* (New Jersey: Princeton University Press, 1992).

apply the modified framework to our EHR example, and conclude that a decentralized approach is particularly ill suited to overcoming the patient information management problem.

TYPES OF SOLUTIONS: INDEPENDENT AND INTERDEPENDENT

We begin with the premise that there are fundamentally two different types of solutions: *independent* and *interdependent*. When solutions are independent, their selection, or adoption, by any actor has no material impact on any other actor. When solutions are interdependent, their selection, or adoption, by any actor has a material impact on all other actors. Hence, there are strategic interdependencies at play. We can illustrate the difference between independent and interdependent solutions with a few simple game theoretic examples.

Let's first consider an independent solution, relevant to government. We have two actors, the Parking Enforcement Department and the Police Department, who both need to acquire new vehicles to conduct their affairs. For sake of simplicity, assume that they can only select amongst two different models, the Smart Car and the Crown Victoria. The Smart Car is a small vehicle with limited space (a two seater), which has a small engine, and is very fuel-efficient. The Smart Car is ideal for a parking enforcement officer, who has to make frequent stops and issue tickets for delinquently parked vehicles. The Crown Victoria, on the other hand, is large vehicle with loads of space (a four seater) and comes with a powerful engine. The Crown Victoria is ideal for police officers, who require a more versatile vehicle to chase down suspects, haul gear, and place citizens under arrest in the back of their cruisers. A hypothetical payoff matrix for Parking Enforcement Department and the Police Department is illustrated in Figure 1 (see following page).

As the payoff matrix in Figure 1 indicates, both actors settle on the Nash equilibrium (the payoff is 10,10, and has been circled). In this example, each actor can select

their most favored solution, and have no negative impact on the other actor. To be specific, the solutions here are independent because the benefit to each actor is not predicated on both actors choosing the same vehicle (or solution), and likewise, choosing alternative vehicles poses no cost (loss of benefit) to any other actor in the system.

		Parking Enforcement Department	
		Smart Car	Crown Vic
Police Department	Smart Car	10, 2	2, 2
	Crown Vic	10, 10	2, 10

Benefits are in form: (Parking, Police)

FIGURE 1 - Vehicle Solution Payoffs

While independent solutions are relatively straightforward, interdependent solutions, which arise from either cooperation or coordination games, are considerably more complicated. First, we consider the canonical cooperation game, the prisoner’s dilemma.¹⁹¹ In this example, we have two actors, A and B, who have both been arrested by the police. The police have insufficient evidence for a big conviction, a ten year sentence, but have enough evidence to put both actors behind bars for one year. The police separate the two actors so they cannot communicate, and then proceed to offer them the same deal. If one actor testifies against the other (defects), while the other remains silent (cooperates), then the defector goes free while his silent accomplice receives a ten year sentence. If both actors remain silent (both cooperate), they each receive a one year sentence. If both actors agree to

¹⁹¹ For an accessible discussion of the prisoner’s dilemma, with applications, see: William Poundstone, *Prisoner’s Delimma* (New York: Doubleday, 1992).

testify, they both receive a five year sentence. The payoff matrix for both actors, A and B, is illustrated in Figure 2 below.

		Actor B	
		cooperate	defect
Actor A	cooperate (stay silent)	1, 1	0, 10
	defect (confesses)	10, 0	5, 5

Years in jail in form (B, A)

FIGURE 2 - Cooperation Game

We assume both actors are rational, and that their only consideration is minimizing their time spent in jail. In this example, the dominant strategy is to defect. Hence, irrespective of actor A's choice, actor B is always better off by defecting, and *vice versa*. Since both actors, A and B, chose to defect, they settle on the Nash equilibrium (the years in jail is 5,5, and has been circled in the Figure). Of course, the equilibrium point is a Pareto suboptimal outcome. If both actors had cooperated (stayed silent), they would have each been rewarded with four fewer years in jail.

Cooperation games, therefore, lead to the first type of interdependent solutions. Here, the solution payoff for an actor depends not only on his actions, but also on the actions of other actors; hence, there is mutual interdependence. In this type of scenario, absent some external force or mechanism, rational actors will fail to cooperate on a solution, leaving everyone involved in a suboptimal position.

Coordination games help to inform the second type of interdependent solutions. Consider a canonical coordination game in which there are two actors, A and B, who

are both driving down a rural road in the opposite direction.¹⁹² Both actors can choose to drive on either the left or the right side of the road. If both actors coordinate their behavior and adopt the same strategy, choosing to drive on the same side of the road, they pass each other without incident. If both actors fail to coordinate their behavior and adopt divergent strategies, the result is a head-on collision. We can illustrate this game in the Figure 3 below, in which strategic payoff for 'passing' results in 10, and a 'collision' results in 0.

		Actor B	
		left	right
Actor A	left	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;"> 10, 10 </div>	0, 0
	right	0, 0	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;"> 10, 10 </div>

Payoff in form (B, A)

FIGURE 3 - Coordination Game

Again, we assume that both actors, A and B, are rational and seek to avoid a head-on collision. In this example, the dominant strategy is to coordinate on either (left, left) or (right, right); there are two Nash equilibriums. When both actors choose the same corresponding strategy, they arrive at a Pareto efficient outcome (in Figure 3, both outcomes have been circled, and the resulting payoff is 10,10). If they fail to cooperate, they collide (payoff is 0,0).

¹⁹² For a more extended discussion on cooperation games, see: Russell W. Cooper, *Coordination Games: Complementarities and Macroeconomics* (Cambridge: Cambridge University Press, 1999).

As this example demonstrates, coordination games are necessarily distinct for cooperation games because the dominant strategy is to cooperate. Cooperation games, therefore, lead to the second type of interdependent solutions. Once again, the solution payoff for an actor depends not only on his actions, but also on the actions of other actors; hence, there is still mutual interdependence. However, in this type of scenario, the only consideration is how actors ought to coordinate on a solution to arrive at a Pareto efficient outcome.

In the preceding section, we identified two basic types of solutions, independent and interdependent. For government, the nature of a solution raises important governance considerations. In the simplest case, when solutions are independent, the only criterion for government is a cost-benefit analysis of some form, and then the selection of the best available option (solution). However, when strategic interdependencies are in play, as in our cooperation and coordination examples, there is an important role for government. To fully illustrate the issues involved, we proceed to the next section of this chapter where we analyze, in game theoretic terms, the behavior of two groups trying to implement an EHR system.

INTERDEPENDENT SOLUTIONS: COORDINATING AND COOPERATING ON AN EHR SYSTEM

In order to illustrate the challenges of implementing an EHR system, consider a highly simplified scenario, in which there are two organizations, the Association of Pediatricians, and the Association of Oncologists, both operating in a public healthcare system. Both Associations operate independently, and are certain that they can improve productivity and patient welfare with the implementation of an EHR system. Furthermore, to keep things simple, assume that each Association has only two actors. Actors A and B belong to the Association of Pediatricians, while actors X and Z belong to the Association of Oncologists. At the local level, actors A and B at the Association of Pediatricians have a choice to use one of two EHR

systems, M and N. Similarly, at the local level, actors X and Z at the Association of Oncologists have a choice to use one of two EHR systems, O and P.

In this example, we make three assumptions: (1) Each EHR system is tailored in a way that maximizes its usefulness (benefit) to specific types of users. Hence, EHR systems M and N are specifically tailored to the needs of Pediatricians, while EHR systems O and P are tailored to needs of Oncologists. (2) As a patient database, EHR systems are more effective when they contain more records. Therefore, there is benefit when actors coordinate on one system, and input all their information into one system. After all, a database system with no data is largely irrelevant. (3) We assume that EHR systems M, N, O and P are not interoperable. Therefore, information stored in one EHR system cannot move to another system.

With the basic elements of this example now in place, consider the choices faced by the two Associations as they seek to implement an EHR solution. First, actors A and B, operating at the local level, must choose between EHR systems M and N. We can illustrate a hypothetical payoff matrix for these actors in Figure 4 (see following page). As Figure 4 demonstrates, the dominant strategy for actors A and B is to coordinate on either EHR system M or N (both Nash equilibriums have been circled).¹⁹³ If the actors coordinate on system M, the Pareto superior outcome, the resulting payoff is 10,10. If the actors coordinate on system N, the Pareto inferior outcome, the resulting payoff is 8, 8. While it is not a given that actors A and B will coordinate on M, the Pareto efficient outcome,¹⁹⁴ we assume they do.¹⁹⁵

¹⁹³ The coordinative benefits here are a direct result of assumption two (2) in this EHR implementation example.

¹⁹⁴ A frequently cited example involves consumers choosing to coordinate on a Video Cassette Recorder (VCR) standard. Two independent solutions (standards) were offered in the 1970s, the Betamax developed by Sony, and the Video Home System (VHS) developed by JVC. While many argue that the Betamax solution was superior, consumers ultimately settled on the VHS standard, perhaps the Nash equilibrium, Pareto inferior, outcome. For more, see: Michael A. Cusumano, Yiorgos Mylonadis and Richard S. Rosenbloom, "Maneuvering and Mass-Market Dynamics: The Triumph of VHS Over Beta," *The Business History Review* 66, no. 1 (1992), pp. 51-94.

¹⁹⁵ We return to the problem of how government can effectively coordinate on a solution later in this chapter.

		Pediatrician - Actor A	
		System M	System N
Pediatrician - Actor B	System M	(10, 10)	5, 4
	System N	4, 5	(8, 8)

Payoffs in form (B, A)

FIGURE 4 – Payoff Matrix for Actors A and B

Next, the oncologists, actors X and Z, operating at the local level, must choose between EHR systems O and P. We can illustrate a hypothetical payoff matrix for these actors in Figure 5 below (note that both Nash equilibriums have been circled). Applying the same logic as we did with the pediatricians, the oncologists coordinate on system O, the Pareto superior outcome, with payoff 10,10.

		Oncologist - Actor X	
		System O	System P
Oncologist - Actor Z	System O	(10, 10)	5, 4
	System P	4, 5	(8, 8)

Payoffs in form (Z, X)

FIGURE 5 – Payoff Matrix for Actors X and Z

Therefore, at the local level, the pediatricians coordinate on ERH system M, while the oncologists coordinate on EHR system O. Both Associations get comfortable using their preferred system, and find that productivity and patient welfare have both improved.

Witnessing the benefits of EHR systems, the Ministry of Health, the manager of the public healthcare system, concludes that getting both Associations to adopt one system would improve the public welfare. After all, one EHR system with more patient records is theoretically more valuable than multiple EHR systems, with fewer records, *ceteris paribus*.¹⁹⁶ Consider, now, the choices (payoffs) facing the two Associations in Figure 6 (see following page). In this cooperation problem, both Associations are better off using their preferred system, irrespective of the adoption decision by the other actor. Each Association, left to their own devices and behaving rationally, plays their dominant strategy and the resulting payoff is 10, 10 (the Nash equilibrium point has been circled in Figure 6). By way of example, if the Association of Pediatricians could be compelled to adopt system O, and the Association of Oncologists played their dominant strategy, the net payoff would be 28 (the lower right quadrant, payoffs 8, 20). Similarly, if the Oncologists could be compelled to adopt system M, the net payoff would be 28 (the top left quadrant, payoffs 20,8). However, absent some external force that imposes a solution, the adoption of either system M or O, both Associations fail to cooperate. The Ministry of Health, therefore, is left in a suboptimal position.

As a quick aside, it is worth highlighting the importance of the second assumption in this example: the lack of EHR system interoperability. The solutions in this example are interdependent precisely because systems M and O cannot communicate. If, however, this assumption were dropped, then both solutions, M and O, would be independent. In this case, both Associations would be free to adopt their uniquely tailored EHR systems, and would both gain the coordinative benefit

¹⁹⁶ Recall the assumption that the EHR systems are not interoperable.

of having more patient records at their disposal. Simply put, the adoption of systems M and O would be the Pareto optimal outcome.

		Association of Pediatricians	
		System M	System O
Association of Oncologists	System M	20, 8	5, 5
	System O	10, 10	8, 20

Payoffs in form (Oncologist, Pediatrician)

FIGURE 6 – Payoff Matrix for the Associations

This example of interdependent solutions, albeit highly simplified, serves to illustrate two broad yet important points. First is the relationship between the design phase of an EHR system, and the implementation phase. Using backwards induction, if the healthcare system is ultimately better off with only one final solution, hence one single EHR system, then it is only rational to develop/design one system, and deploy one system. Put another way, it is cost ineffective to adopt a decentralized approach, in which multiple actors design multiple systems, and then try to cooperate on one final solution. This first point is important because it sheds light on the Ontario EHR project that was defined, in part, by a decentralized approach. Although a more in depth and nuanced analysis will be provided in chapter 6, it is worth recalling that by 2010, the province of Ontario had upwards of twenty different EHR systems in operation that were largely incompatible (not

interoperable).¹⁹⁷ Moreover, it also worth recalling that, at the outset of the project, the government noted the necessity of developing a central system precisely to ensure interoperability across the province.¹⁹⁸ Therefore, this raises the question of whether the Ontario EHR project fiasco can be explained, in part, by a large number of independent actors each designing and implementing their own solutions (EHR systems) without considering the strategic interdependencies in play.

The second important point involves government, and how it can best deploy its authority to manage the interdependent solutions. As the example demonstrated, absent some external force, both Associations failed to cooperate on a single EHR system. This failure to cooperate resulted in society as a whole being worse off. Notwithstanding the first point laid out above, when cooperation and coordination issues arise, there is a role for a central authority, a role for government. Government, by virtue of its unique position in society, has the legitimate right to exercise its authority to manage interdependent solutions. Authority, of course, comes in different forms. For government intervention to be effective, the use of authority must be matched in a logical and discriminating manner to the nature of interdependent solutions. With this in mind, we turn our attention to the second part of this chapter, which examines the types, or forms, of government authority, and how it can best be applied to interdependent solutions.

THE USE OF GOVERNMENT AUTHORITY AND INTERDEPENDENT SOLUTIONS

We start with the rather uncontroversial premise that government has the legitimate right to exercise authority within the boundaries of the state. Hence, within reasonable limits, government is legitimately entitled to suggest, or compel,

¹⁹⁷ "Ontario's Plan for Electronic Health Records is at Risk, Official Says," *Canadian Medical Association Journal*, 2010, p. 254.

¹⁹⁸ Hugh MacLeod and others, "The Times they are A-Changing: What Worked and what we Learned in Deploying Ontario's Wait Time Information System," *Healthcare Quarterly* 12, no. Special Issue (2009), p. 13.

citizens to behave in a certain manner. The use of authority by government can assume one of three fundamentally different political forms: *persuasion, incentives, or rules*.¹⁹⁹ Each of these forms, described in greater detail below, is a tool that can be used to alter the behavior of an actor, or group of actors. In practice, the effectiveness and appropriateness of each tool is highly depending on the political context of any given situation. In the abstract, each tool is simply a different means to an end.

The first form of authority is persuasion, or the use of argument and rhetoric to compel actors to behave in a certain way. Burnell and Reeve define persuasion as:

[Actor A] gets [actor B] to do or believe or accept or reject something which he would not otherwise do or believe or accept or reject, by exhibiting reasons or by exhibiting consequences of alternatives confronting [actor B].²⁰⁰

The use of persuasion as a political tool, or as an expression of authority, is familiar to all political scientists. International relations scholars sometimes refer to persuasion as 'soft power',²⁰¹ while Americanists frequently refer to the 'power of the bully pulpit'.²⁰² Irrespective of language choice, persuasion refers to the use of authority through argument, reason, and moral justification, which is necessarily outside of the power family of options (incentives and rules). Used as a tool,

¹⁹⁹ In what follows, we adopt an economic approach to consider the different forms of government authority. While this approach is relatively straightforward, it abstract away from some important ethical considerations on the use of authority. For excellent discussion on ethics and the use of authority, see: Ruth R. Grant, "Ethics and Incentives: A Political Approach," *American Political Science Review* 100, no. 1 (2006): pp. 29-39.

²⁰⁰ Peter Burnell and Andrew Reeve, "Persuasion as a Political Concept," *British Journal of Political Science* 14, no. 4 (1984), p. 394.

²⁰¹ The term 'soft power' was coined by Joseph Nye in 1991; see: Joseph S. Nye, *Bound to Lead: The Changing Nature of American Power* (New York: Basic Books, 1991). For a more recent and nuanced account, see: Joseph S. Nye, *Soft Power: The Means to Success in World Politics* (New York: PublicAffairs, 2004).

²⁰² For an examination on persuasion, and its limits, in American presidential politics, see: George C. Edwards, *On Deaf Ears: The Limits of the Bully Pulpit* (New Haven: Yale University Press, 2006).

persuasion is often an attractive option for elected decision-makers, precisely because there are limited financial costs.²⁰³

Persuasion can be an effective tool to address interdependent solutions that require coordination. As Foss notes, leadership (used as a synonym for persuasion) can be used to coordinate the complementary actions of many actors, simply through development of shared beliefs conditions.²⁰⁴ Consider, again, the example of the two Pediatricians, A and B, and their choice between two independent EHR systems, M and N (refer back to Figure 4). Recall that there were two Nash equilibriums, where actors A and B could coordinated on either systems M or N. Coordination on either EHR system was a possibility, despite one being Pareto superior (10,10) and the other being Pareto inferior (8,8). In order to increase the likelihood that system M will be adopted, government can deploy its authority, through persuasion, in order to help 'tip the scales' towards the optimal outcome. Hence, if government can establish a shared belief amongst independent actors that coordination on system M is preferable than coordination on system N, then it can arrive at the optimal solution without resorting to the use of incentives or rules. The importance of persuasion, beliefs and leadership in coordinating behavior on ehealth systems is a recurring theme in the literature, and applies at the both the organizational and provincial levels.^{205, 206, 207, 208, 209, 210, 211, 212}

²⁰³ By way of example, consider a TV advertising campaign conducted by government to advance a public message. It might cost hundreds of thousands of dollars, but all things considered, persuasion remains a relatively inexpensive way to exercise authority.

²⁰⁴ Nicolai Foss, "Leadership, Beliefs and Coordination: An Explorative Discussion," *Industrial and Corporate Change* 10, no. 2 (2001), pp. 357-388.

²⁰⁵ Asif Ahmand and others, "Key Attributes of a Successful Physician Order Entry System Implementation in a Multi-Hospital Environment," *Journal of the American Medical Informatics Association* 9 (2002), pp. 16-24.

²⁰⁶ Michael D. Gray and Bill G. Felkey, "Computerized Prescriber Order-Entry Systems: Evaluation, Selection, and Implementation," *American Journal of Health-System Pharmacy* 61, no. 2 (2004), pp. 190-197.

²⁰⁷ Nancy M. Lorenzi and Robert T. Riley, "Organizational Issues = Change," *International Journal of Medical Informatics* 29, no. 2 (2003), pp. 197-203.

²⁰⁸ John S. Lou, "Computer Physician Order Entry: To Implement Or Not?" *Primary Psychiatry* 13, no. 3 (2006), pp. 19-21.

²⁰⁹ Eric G. Poon and others, "Overcoming Barriers to Adopting and Implementing Computer Physician Order Entry Systems in U.S. Hospitals," *Health Affairs* 23, no. 4 (2004), pp. 184-190.

Incentives are the second form of authority, and involve government using financial mechanisms to try and compel actors to behave in a certain way. Here, actor A gets actor B to accept or reject something which he would not otherwise accept or reject, by changing the financial calculus of actor B.²¹³ Incentives are a commonly employed strategy in government. In the positive sense, government might offer a financial incentive, like a tax credit (hence a subsidy) to encourage citizens to take music lessons. Similarly, but in the negative sense, government might increase taxes on cigarettes in order to discourage consumption (hence, a disincentive). Incentives, as means to exercise authority, have limits. Incentives can only encourage the behavior of actors, because decision rights ultimately rest with the independent actors.²¹⁴ Hence, when interdependent solutions manifest themselves in society, government cannot ensure compliance solely through the use of incentives.

Incentives can be effective to address interdependent solutions that require coordination and/or cooperation.²¹⁵ Consider, again, the simple example of the two Associations and their choice to adopt EHR systems M or O (refer back to Figure 6). Both Associations, playing their dominant strategy, fail to cooperate. The result was the Nash equilibrium outcome with payoff 10,10, a suboptimal solution. Clearly, there is an opportunity for government to assert its authority and offer an incentive to encourage cooperation on one system. By way of example, consider an incentive equivalent to three units of benefit paid to the Association of Oncologists if they

²¹⁰ David M. Schuster and others, "Involving Users in the Implementation of an Imaging Order Entry System," *Journal of the American Medical Informatics Association* 10, no. 4 (2003), pp. 315-321.

²¹¹ Tim Scott and others, "Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study," *BMJ - British Medical Journal* 331 (2003), pp. 1313-1316.

²¹² Robert L. Wears and Marc Berg, "Computer Technology and Clinical Work," *JAMA - the Journal of the American Medical Association* 293, no. 10 (2005), pp. 1261-1263.

²¹³ Peter Burnell and Andrew Reeve, "Persuasion as a Political Concept," *British Journal of Political Science* 14, no. 4 (1984), p. 400.

²¹⁴ Evert Vedung, "Policy Instruments: Typologies and Theories," in *Carrots, Sticks and Sermons: Policy Instruments and their Evaluation*, eds. Marie-Louise Bemelmans-Videc, Ray C. Rist and Evert Vedung (New Jersey: Transaction Publishing, 2007), p. 24.

²¹⁵ While we forgo a discussion of how incentives can overcome coordination problems, consider that even incredibly small incentives may be sufficient to 'tip the scales' and ensure a desired outcome is adopted.

adopt system M. Assuming the Oncologists are rational actors, they are now better off by adopting system M (hence, $\text{benefits}_M > \text{benefits}_O$, or $11 > 10$). Moreover, despite a government expenditure equivalent to three units of benefit, the net benefit of this expenditure is five units.²¹⁶ Clearly, incentives can be a useful expression of government authority to address the challenges posed by interdependent solutions. The use of incentives, to encourage system adoption and facilitate cooperation, is widely discussed in the ehealth literature,^{217, 218, 219} while specific attention is frequently paid to the use government incentives to ensure adoption, coordination, and cooperation on ehealth systems.^{220, 221}

Finally, we have the third form of authority, rules, which involves forcing actors to behave in a certain way. Here, actor A (the government) gets actor B to accept or reject something which he would not otherwise accept or reject, by forcing actor A's preferences on actor B. Rules, as an expression of authority, is also frequently labeled as coercive authority, and most frequently arises from government legislation or regulation.²²² Government frequently establishes rules that restrict the behavior of actors, for example, by outlawing theft, abuse and murder. Similarly, government might establish rules to overcome coordination problems, for example, by ensuring that everyone drives on the right side of the road. The two key attributes of the rules based expression of government authority are: (1)

²¹⁶ Cooperating on system M results in a net benefit of 28. The Nash equilibrium outcome (absent the incentive) results in a net benefit of 20. The incentive cost to ensure cooperation on M is 3. Therefore, $28 - 20 - 3 = 5$ (units of benefit).

²¹⁷ Dara L. Grieger, Stephen H. Cohen and David A. Krusch, "A Pilot Study to Document the Return on Investment for Implementing an Ambulatory Electronic Health Record at an Academic Medical Center," *Journal of the American College of Surgeons* 105, no. 1 (2007), pp. 89-96.

²¹⁸ Joan Henderson, Helena Britt and Graeme Miller, "Extent and Utilization of Computerization in Australian General Practice," *Medical Journal of Australia* 185, no. 2 (2006), pp. 84-87.

²¹⁹ Denis Protti, Steven Edworthy and Ib Johansen, "Adoption of Information Technology in Primary Care Physician Offices in Alberta and Denmark," *Healthcare Quarterly* 10, no. 3 (2007), pp. 95-102.

²²⁰ James G. Anderson, "Social, Ethical and Legal Barriers to E-Health," *International Journal of Medical Informatics* 76, no. 5 (2007), pp. 480-483.

²²¹ D. Levick, H. F. Lukens and P. L. Stillman, "You've Led the Horse to Water, Now how do You Get Him to Drink: Managing Change and Increasing Utilization of Computerized Provider Order Entry," *Journal of Healthcare Information Management* 19, no. 1 (2005), pp. 70-75.

²²² Vedung, *Policy Instruments: Typologies and Theories*, p. 23.

independent actors no longer have freedom of choice, they must obey;²²³ (2) there is no immediate financial cost for government, notwithstanding the costs of the legislative/regulatory process. While the cost factor might suggest that the use of coercive authority to legislate or regulate a solution is always preferable, elected decision makers in government are frequently reticent to simply impose a solution. The imposition of a solution through rules might have no immediate financial costs, but there are certainly political costs: a frustrated constituency that has to absorb transition costs, and have their freedoms curtailed by the coercive powers of the state. Therefore, the rules based approach is frequently a measure of last resort for elected decision makers.

Rules are often the most efficient way for government to address interdependent solutions that require coordination and/or cooperation. Consider, for the last time, the simple example of two Associations and their choice to adopt EHR systems M or O (refer back to Figure 6). Recall that both Associations failed to cooperate, resulting in the Nash equilibrium outcome of 10,10 (a net benefit of 20). Now, consider if government simply passed a law that compelled both Associations to cooperate on system M. The Association of Oncologists would lose two units of benefit, but net result of the forced cooperation is 28. Hence, by intervening and establishing a rule, government increased the net benefit by 8 units.²²⁴ Moreover, recall that using incentives to compel both Associations to cooperate on system M cost the government the equivalent of three units of benefit. Therefore, in this theoretical exercise, government could save the equivalent of three units of benefit by simply imposing a solution. Notwithstanding the reticence of elected decision makers to impose solutions, there is an ongoing debate in the literature on the appropriateness of government intervention to force adoption, coordination and cooperation on ehealth systems. Those who champion the rules based approach

²²³ While one could argue that everyone has choice, the penalty for disobeying government rules is such that we assume obedience from rational actors.

²²⁴ Both Associations cooperating on M results in 28 units of benefit. Absent government intervention, the net benefit is 20. Therefore, $28 - 20 = 8$ (units of benefit).

suggest that, absent government intervention, ehealth systems will remain independent (not interoperable) and individual actors will fail to cooperate.^{225, 226} However, others argue that healthcare organizations are large and complex, with their own unique organizational cultures, and power structures, that will simply fail to efficiently respond to government edicts. In effect, they argue that the imposition of ehealth solutions will create internal organizational strife, and make a difficult implementation situation even more challenging.^{227, 228}

To summarize, we have identified three forms of government authority, persuasion, incentives and rules, which can be applied to overcome the inherent challenges posed by interdependent solutions. When interdependent solutions manifest themselves in society and coordination is required, the analysis suggests that government ought to use persuasion or incentives. Likewise, when cooperation is required, the analysis suggests that government ought to use incentives or rules. We are largely agnostic on the choice of authority that government can exert in either scenario (when either coordination or cooperation is called for). It is sufficient to illustrate that there is choice, and when governments are faced with interdependent solutions, they much chose. Failure to act will ultimately increase the costs of finding workable solutions, and will leave all members of society worse off.

GENERAL OBSERVATIONS

At the beginning of this chapter, we questioned whether the decentralized approach adopted by the province of Ontario was appropriate to develop an EHR system to serve the public interest. In order to address this question, we employed a simple

²²⁵ Rachel Foster, "Regulation 'Big Deal' for EHRs," *Hospital and Health Networks* 80, no. 9 (2006), pp. 22-24.

²²⁶ *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, pp. 253-254.

²²⁷ J. R. Pilling, "Lessons Learned from a Whole Hospital PACS Installation. Picture Archiving and Communication System," *Clinical Radiology* 57, no. 9 (2002), pp. 784-788.

²²⁸ Protti, Edworthy and Johansen, *Adoption of Information Technology in Primary Care Physician Offices in Alberta and Denmark*, pp. 95-102.

game theoretic framework to analyze the implications of independent actors developing and implementing independent EHR systems. While this study will have more to say on this issue in chapter six, we concluded from our theoretical exercise that EHR solutions are highly interdependent and would be ill served by an independent, or decentralized, approach. Moreover, given the nature of interdependent solutions, we suggested that it is highly appropriate for government to actively intervene and exert its authority to facilitate adoption, coordination and cooperation on EHR systems.

By employing backwards induction and looking at the type of solution required to successfully overcome the patient information problem, one lesson becomes rather evident: there is value in developing one solution, hence one EHR system. In an ideal scenario, governments would use backwards induction to analyze the type of solution required to overcome any given problem, and then take action. Hence, if governments would consider the issues surrounding the implementation phase of their EHR solution(s), they would ostensibly be in a better position to avert long term problems.

If we can accept, *ceteris paribus*, that implementing one EHR system in Ontario would have led to a superior outcome, then our attention should naturally turn to the design phase of the project. At question, therefore, is how government can most efficiently develop an EHR solution. In the opinion of this research study, how governments organize themselves to arrive at policy/project solutions is under theorized. In this chapter we have identified that there are different types of solutions (independent and interdependent). It is only natural to suggest that there are also different types of problems, which require different organizational structures, to efficiently arrive at solutions. In the following chapter, we turn our attention to the design phase of the project, and develop a framework that matches the nature of problems to specific types of organizational forms, which in turn dictates the efficiency of arriving at valuable solutions.

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Chapter Five

A FRAMEWORK FOR THE DESIGN PHASE

As outlined in chapter three, the government of Ontario faced two separate but related problems with regard to the EHR project – a design problem and an implementation problem. The design problem focused on devising a comprehensive ehealth system that would enable medical data to be shared and utilized across the healthcare system. The implementation problem, on the other hand, focused on putting the designed system into operation. To ensure an effective solution to these problems, government decision makers ought to consider them in reverse order, since effective design work can only be carried out if the subsequent implementation phase is well understood. Following this logic, the preceding chapter examined the incentives for implementation that different groups involved in the health system possess. Given this knowledge of the implementation phase of the EHR project, attention can now be directed to the design phase.

In what follows, we develop a coherent theoretical framework to think about technology problems, and how government should be organized to develop, or design, technology solutions. This framework is a valuable tool because it links

problems, organization, and solutions together. Once developed, the framework can assist in dissecting the nature of the two basic design problems facing the EHR project: the construction of a secure electronic network, and the development of the EHR software. These two design problems required the government of Ontario to search for solutions. During the project, the government of Ontario established a central agency, the SSHA, to locate a solution to the network problems, while a traditional line department, the MOHLTC, was tasked with locating a solution to the software problem. At question in chapter six is whether these organizations were appropriately structured to tackle the design problems just identified. Our attention, in this chapter, is to develop a framework with which to undertake this analysis.

THE DESIGN PROBLEM

The framework used to examine the issues facing decision makers at the design phase is based on the model of Nickerson and Zenger.²²⁹ At the core of their model is the problem that the decision makers wish to address (in the case of EHR project, the problem would be the development of an electronic network, and the associated software, that would facilitate the sharing of health records). Solutions to this problem are defined by different combinations of design elements (or knowledge sets), with different combinations (and thus solutions) generating different costs and benefits (and hence net benefits).

It is relatively straightforward to visualize problems, and their corresponding solution landscapes, three dimensionally. In this three dimensional space, an (x, y) point represents a particular combination of the design elements X and Y. The net benefit (or value) of this combination is given by the height z of the three dimensional curve.

²²⁹ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, pp. 617-632.

PROBLEMS AND SOLUTION LANDSCAPES

Choosing the right combination of design elements – i.e., the combination that generates the greatest net benefit – can be difficult, however. As Nickerson and Zenger outline:

Peaks on such solution landscapes represent valuable combinations of knowledge sets or technologies that are highly complementary. Valleys on such landscapes represent low-value combinations of existing knowledge. When knowledge sets are highly interdependent, solution landscapes are more rugged and unpredictable. Under these conditions, the value of the global maximum rises, but the average height of peaks declines. On these more rugged landscapes, a series of incremental changes in design are unlikely to lead to the discovery of highly valuable solutions.²³⁰

Indeed, Nickerson and Zenger argue that different types of solution landscapes require different search (or design) procedures. Borrowing from Herbert Simon's typology of complex systems, Nickerson and Zenger suggest that there are three fundamental types of problems: decomposable or low-interaction problems, nondecomposable or high-interaction problems, and nearly decomposable problems with moderate levels of knowledge interaction.²³¹

Decomposable or low-interaction problems are ones where the value of a solution depends very little on the interaction among knowledge sets and design choices. As Nickerson and Zenger note, "with such problems, groups of individuals possessing rather distinct knowledge sets can independently apply their knowledge to unique design choices with a reasonable expectation that the aggregation of their independent efforts, along with the independent efforts of others with distinctly different knowledge sets, will uncover valuable"²³² solutions. The key here is that no coordination is required amongst relevant actors to discover valuable solutions.

²³⁰ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p 619.

²³¹ *Ibid.*, pp. 617-632.

²³² *Ibid.*, p. 619.

A simple example illustrates the nature of decomposable, or low interaction, problems. Consider the problem of developing a high performing desktop computer. Within a range, performance could be improved by individuals independently developing a better hard drive, or a new video card, or a faster processor, among any number of possibilities. Given the nature of large desktop computers, in which physical space, energy, and heat are not consequential, once a new component, or subsystem, is developed, it can be swapped in to improve overall performance. Perhaps more importantly, the new subsystem (or solution) has no meaningful negative impact on the performance of any other subsystems currently part of the desktop computer. Hence, groups can work independently, attacking different subproblems without consideration to what their counterparts are doing, and still improve overall performance, or the value of the solution.²³³

The solution landscape in the decomposable case can be illustrated graphically. As Figure 1 illustrates (see following page), it is possible to optimize on design element X (i.e., choose the value of this element that generates the highest value) without any knowledge of what the optimal value is of design element Y. Likewise, it is possible to optimize on design element Y without any knowledge of what the optimal value is of design element X. As a result, design can take place by individuals or groups acting independently. While some communication is required to find the optimal combination of X and Y, this communication need only take place at the very end. Prior to this, the searches can proceed independently.

Nondecomposable, or high-interaction, problems are ones in which the solution value is highly dependent on the interaction of design choices. Here, knowledge sets cannot be broken down into subproblems, since the interaction amongst distinct knowledge sets are simply too extensive. The implication, of course, is that groups of

²³³ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 620.

individuals possessing distinct knowledge sets cannot independently apply their knowledge to unique design choices, with any reasonable expectation that their efforts will uncover valuable solutions.²³⁴

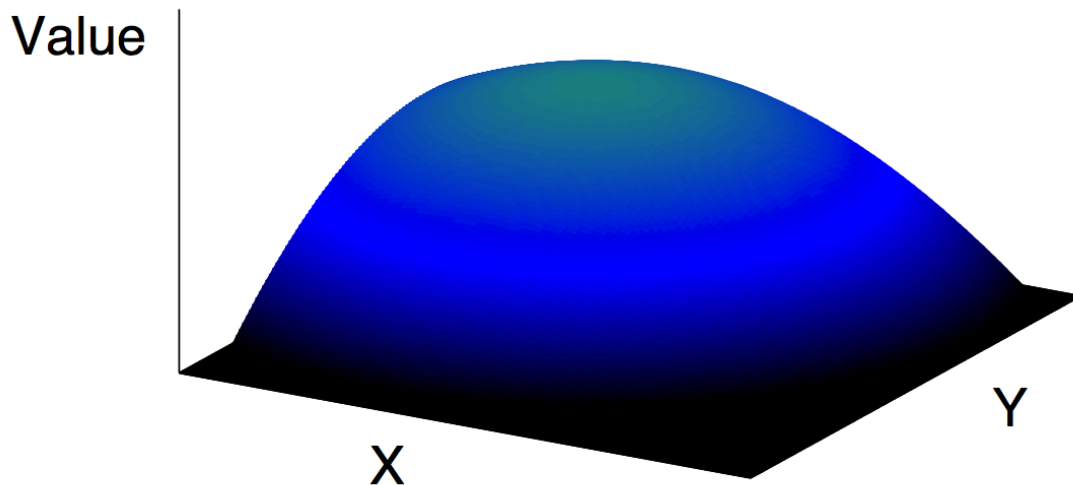


FIGURE 1 – Decomposable Problem

The development of a microprocessor can be considered a nondecomposable problem. In developing a better processor, each design choice necessarily impacts all other design choices.²³⁵ Modifying and increasing the bus speed, for instance, could increase the production of heat, damaging the rest of the processors' circuitry and thus reduce overall performance. Similarly, developing a larger memory cache could increase the demand for energy, drawing it away from the core, and ultimately decreasing overall performance. The key point is that no group of actors, operating in isolation with distinct knowledge sets, can hope to develop a new microprocessor based exclusively on their stock of knowledge. Ultimately, the effectiveness of the design process depends on the coordinated efforts of a group with different knowledge sets, and using different design choices, working towards a common end. Hence, in our simplistic examination of the microprocessor, the circuitry, bus, cache

²³⁴ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p 619.

²³⁵ *Ibid.*, p. 620.

and core must all work together, the result of a planned and coordinated effort to arrive at a solution.²³⁶

The solution landscape in the nondecomposable case can also be illustrated graphically. As Figure 2 illustrates (see following page), it is impossible to exclusively optimize on design element X (i.e., choose the value of this element that generates the highest value) without a thorough understanding, or knowledge, of the interaction between elements X and Y. The same logic applies to exclusively optimizing on design element Y. Simply put, with nondecomposable problems, design elements X and Y are highly interdependent. As a result, design cannot take place by individuals or groups acting independently. Coordination, by actors with extensive knowledge of both design elements X and Y, and the nature of their interaction, is required for search.

Finally, we have moderate-interaction, or nearly decomposable, problems which exists between our low-interaction and high-interaction problems. As Nickerson and Zenger note, “the level of interaction among design choices is intermediate in the sense that subproblems associated with distinctive knowledge sets can be defined, but the value of a design choice within one subproblem is not fully independent of the design choices made in another subproblem.”²³⁷ Therefore, while the interactions amongst knowledge sets are not trivial, “near decomposability suggests that interactions among knowledge sets within subproblems are greater than among subproblems.”²³⁸

An example of a nearly decomposable problem would be improving the performance of a laptop computer. While building a better laptop can clearly be separated into a number of subproblems, for example improving the screen, hard

²³⁶ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p 620.

²³⁷ *Ibid.*, p. 621.

²³⁸ *Ibid.*, p. 621.

drive, or motherboard, each design choice involves a number of tradeoffs and interdependencies. Improving screen size and quality, for example, affects the size, weight, and battery life of the laptop. Similarly, a high end and separate graphics card might only slightly increase the overall weight of the laptop, but draw significantly more energy, thereby reducing overall system performance. Each component, therefore, interacts with every other component in a non-trivial way. Necessarily, some degree of coordination is required amongst groups of individuals working on the nearly decomposable problems, in order to achieve an effective, complete and valuable solution.

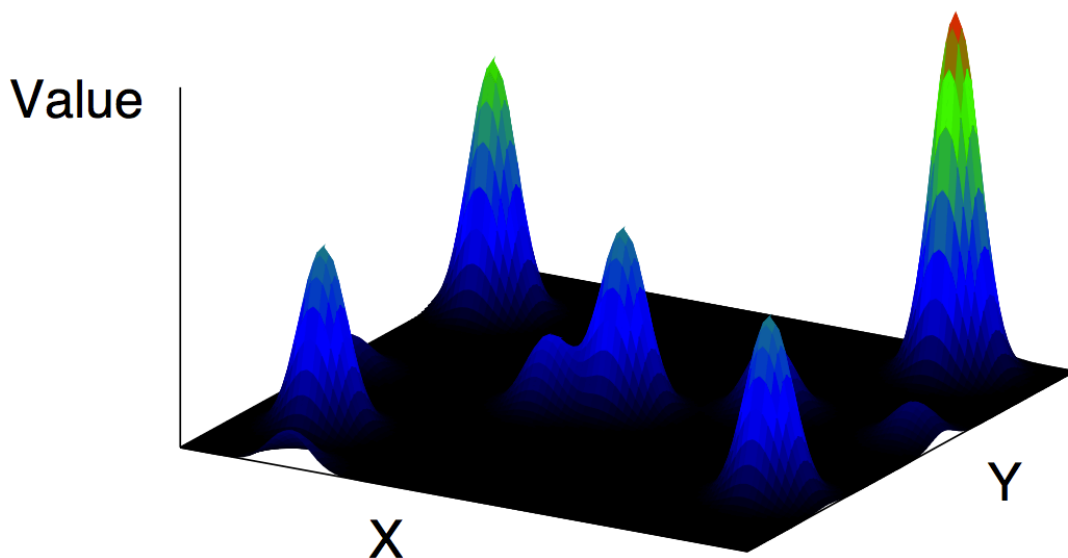


FIGURE 2 – Nondecomposable Problem

The solution landscape in the nearly decomposable case is illustrated graphically in Figure 3 (see following page). As the Figure illustrates, specific combinations of design elements X and Y that manifest themselves in high value solutions are clustered in one area. The implication of the clustering of (high value) solutions suggests that it is impossible to optimize on design element X without knowledge of the interaction amongst element X and Y. Similarly, it is impossible to optimize on design element Y, without knowledge of interaction amongst elements X and Y.

Hence, because design elements X and Y are (moderately) interdependent, knowledge of how they interact is critical in order to locate high value solutions. However, once the nature of the interaction between design elements X and Y is defined, and hence there is an appreciation of where the cluster of high value solutions is located on the landscape, then it is possible to independently optimize on individual design elements. At this point, it is possible to optimize of design element X (i.e. choose the value of this element that generates the highest value) without any knowledge of what the optimal value is of design element Y, and *vice versa*. Therefore, with nearly decomposable problems, a common understanding of design elements X and Y and the nature of their interaction are initially required for search. However, once the nature of the interaction has been established, design (or search) can take place by individuals or groups acting independently.

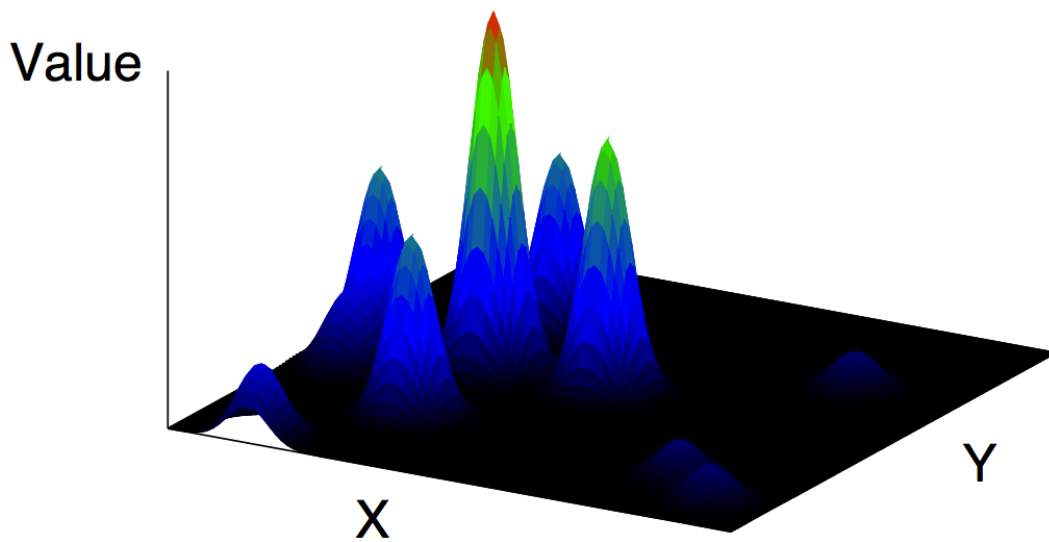


FIGURE 3 – Nearly Decomposable Problem

If problems are the basic unit of analysis, and the end points are valuable solutions, then we need a means to an end. How do we go from point A to point B? How should organizations search for solutions? Following from Nickerson and Zenger, we now turn our attention to two basic methods of search. Once these methods are identified, we match them in a discriminating manner to the nature of the problem

under investigation (i.e., whether the problem is decomposable, nearly decomposable, or nondecomposable).

PROBLEMS AND THE METHODS OF SEARCH

The three types of problems identified above result in three related types of solution landscapes. Once a type problem has been identified, decision makers are aware of the type of solution landscape under investigation. However, decision makers are unaware of the precise contours of the landscape. Therefore, to effectively explore these landscapes, decision makers are required to conduct a search. Different types of solution landscapes benefit from different methods of search, or search strategies. According to the framework, there are two distinct approaches to search: directional and heuristic.²³⁹

Directional, or local search, is reliant on the feedback or experience of previous trials.²⁴⁰ In this form of search, new combinations of design elements are pursued sequentially, by altering one design element at a time. With each design change, the resulting change in the solution value can be observed. If the design change yields a higher solution value, then the search continues along the path. Similarly, if the design change yields a lower solution value, then the original design is restored, and a new path (or design choice) is chosen. The key attribute of directional search is the focus on only one design element of a problem. Hence, an actor using directional search need not understand, *a priori*, the nature of the interaction amongst design elements of any given problem.

²³⁹ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 621.

²⁴⁰ This form of search has assumed a number of labels, including experiential search, or the search by trial and error, but the basic premise is the same. See, for example: Ross W. Ashby, *Design for a Brain* (London: Chapman and Hall, 1952).; James G. March and Herbert A. Simon, *Organizations* (New York: John Wiley, 1958).; Richard M. Cyert and James G. March, *A Behavioral Theory of the Firm*, Second ed. (Oxford: Blackwell Publishers, 1992).; Herbert A. Simon, *The Sciences of the Artificial* (Cambridge: MIT Press, 1981).; Richard R. Nelson and Sidney G. Winter, *An Evolutionary Theory of Economic Change* (Cambridge: Belknap Press, 1992).

To illustrate directional search, consider an example of two independent actors, M and N, working on the decomposable problem illustrated graphically in Figure 4 (below). In this example, actor M only has knowledge of design element X, while actor N only has knowledge of design element Y. Actor N begins his search fixed at X_1 and optimizes on design element Y. His first design combination, X_1 and Y_1 (point A in the figure) results in a solution valued at Z_1 . In this second trial, N selects design choice X_1 and Y_2 (point B in the figure), resulting in a solution valued at Z_2 . Observing the results, actor N realizes that $Z_1 > Z_2$, and the solution is therefore less valuable. Having metaphorically ‘walked down the hill’, actor N returns to point A, and chooses an alternative design choice, X_1 and Y_3 (point C), resulting in a value of Z_3 . Using direction search, actor N concludes that his most recent design choice (X_1, Y_3) is superior to his previous attempts ($Z_3 > Z_1 > Z_2$), and ends up with a higher value solution. Now, consider actor M, who has just observed the final result of actor N (X_1, Y_3, Z_3). Actor M, who can only optimize on design element X, keeps Y_3 and moves from X_1 to X_2 (point D in the figure), resulting in Z_4 . Actor M observes that he found a higher value solution ($Z_4 > Z_3$), and has metaphorically ‘climbed the solution hill.’

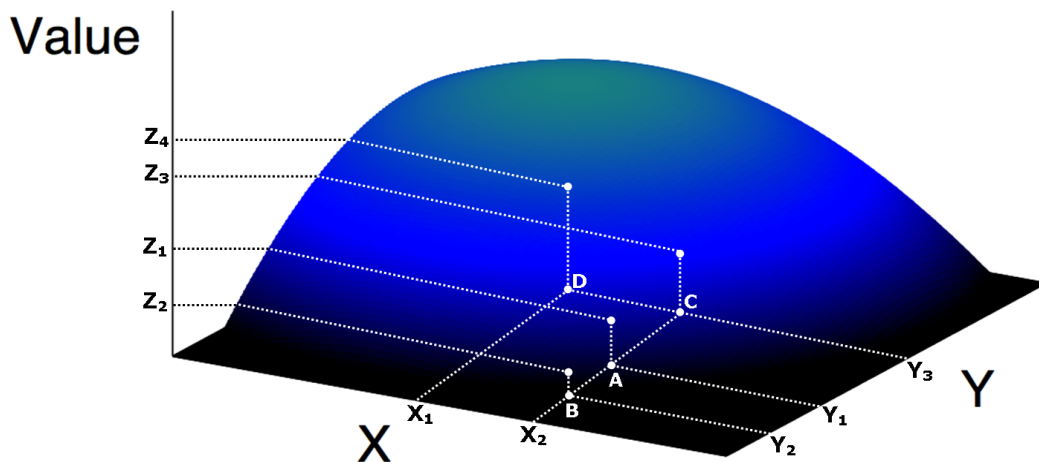


FIGURE 4 – Directional Search

As the example demonstrates, directional search does not require coordination between actors M and N to arrive at higher value solutions. Each actor, operating independently, and without knowledge of the nature of the interaction amongst design elements X and Y, can optimize on one design element and arrive at a higher valued solution. To be explicit, while independent actors are likely to have their own theories about the relationship between X and Z, or Y and Z, these theories need not be aligned with the theories possessed by other actors working on the same problem. Hence, actors can search independently, without a common theoretical understanding of how the design elements interact.

Heuristic, or cognitive, search occurs when an actor, or a group of actors, cognitively evaluates how different design choices interact. In this form of search, new combinations of design elements are considered together. Search trials are therefore a product of optimizing on all design elements concurrently, as opposed to sequentially. The use of heuristics, informing a cognitive representation of the solution landscape, allows actor(s) to select trials that maximize the probability of finding a high-value solution. As Nickerson and Zenger note,

[Search trials] are thus selected based on a cognitive map or implicit theory of how knowledge sets and specific design choices relevant to the problem interact to determine solution performance. These heuristics can be thought of as simplified representations of the solution landscape or, as Gavetti and Levinthal describe, 'cognitive representations... of lower dimensionality than the actual landscapes.' [As Walsh notes], these 'theory-driven structures' speed problem solving by 'furnishing a basis for evaluating information.' These cognitive representations of the solution landscape are then used to select trials that maximize the probability of quickly discovering a high-value solution. Of course, cognitive maps are not static. As trials are undertaken and knowledge is gleaned through feedback, [decision makers] update their heuristics.²⁴¹

²⁴¹ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 621.

To illustrate heuristic search, consider another simple example with two actors, F and G, each working independently on the nondecomposable problem illustrated in Figure 5.

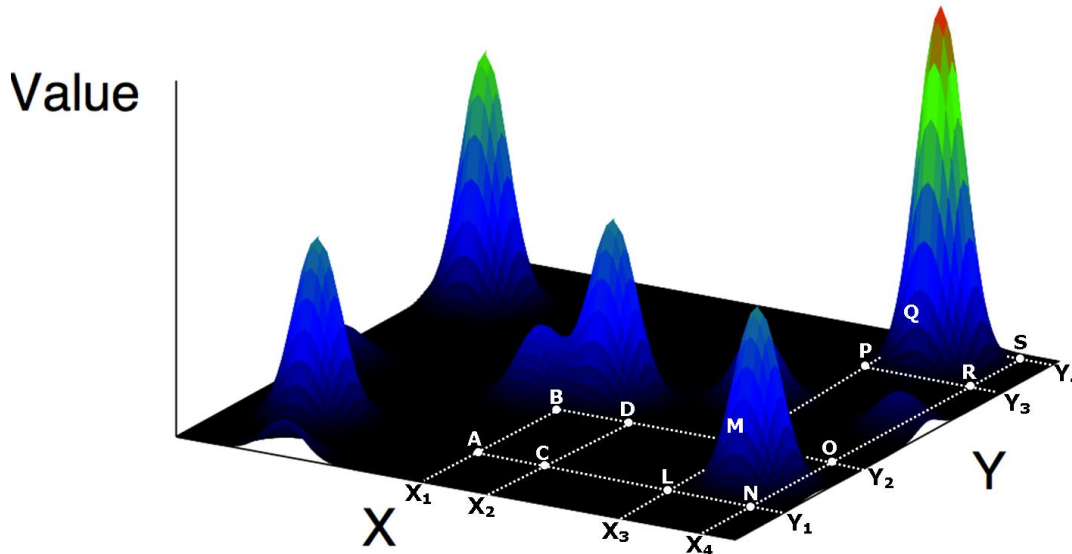


FIGURE 5 – Heuristic Search

First, we have actor F who employs directional search, and modifies design element X, between X_1 and X_2 , and element Y, between Y_1 and Y_2 (hence, in space defined by the rectangle ABCD). No matter what combinations of design choices X and Y (bounded by ABCD) he selects, actor F will never locate a valuable solution. In the space defined by ABCD, there simply are no valuable solutions to be discovered. Now, reflect on actor G, who possesses a cognitive appreciation of how design elements X and Y interact. Given actor G's knowledge, he discounts searching in the space defined by ABDC, and opts instead to optimize on X, between X_1 and X_2 , and on Y, between Y_1 and Y_2 (hence, in space defined by the rectangle LMNO). With consideration given to how the design elements interact, and employing his search heuristic, actor G is quite likely to discover a valuable solution in the space defined by LMNO. Moreover, it is certainly possible that through his search process, actor G discovers new information (gains new knowledge) of how the design elements interact, leading to a new search around the space defined by PQRS (where the

highest solution value is found). Therefore, heuristic search is defined by an actor(s) possessing knowledge of how design elements interact, and using that knowledge to develop a cognitive map of the solution landscape to guide the search process.

Heuristic search is a powerful approach to problem solving that takes on two different forms, based on whether the solution is being sought by an individual or a group of individuals. As Herbert Simon rightly pointed out, individuals face cognitive limitations and are thus boundedly rational. The human mind is incapable of digesting and applying an infinite amount of knowledge, and thus cannot be “rational” in the pure sense.²⁴² If an individual had infinite cognitive capacity, and could absorb all possible knowledge relevant to a given problem, he would be able to single handily develop advanced theories about the structure of the knowledge and design interactions, and undertake an optimal pattern of search. Given our knowledge of bounded rationality, the solutions to complex problems will often require distinct knowledge sets, possessed by different individuals, therefore requiring a collective approach to problem solving.²⁴³ As Foss notes, coordinating and aggregating the dispersed knowledge of multiple actors is best achieved through formal organization.²⁴⁴ Or, as Loasby notes, “firms [or groups, or organizations] are a response to human cognitive limitations.”²⁴⁵ In practice, therefore, we are primarily concerned with group behavior and heuristics (within organizations), and not the behavior of individuals operating in isolation.

Regarding the search heuristics of groups, Nickerson and Zenger nicely encapsulate the issues at hand:

²⁴² Herbert A. Simon, *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization* (New York: Macmillan, 1957).

²⁴³ The example of heuristic search illustrated in Figure 5 was highly simplified, given that there were only two design elements (X and Y). In practice, however, complex problems are likely to have dozens of design elements that all interact. Therefore, it is almost a certainty that the knowledge sets of multiple actors will be required to understand the nature of these interactions.

²⁴⁴ Nicolai Foss, “Leadership, Beliefs and Coordination: An Explorative Discussion,” *Industrial and Corporate Change* 10, no. 2 (2001), pp. 357-388.

²⁴⁵ Brian Loasby, “Organizations as Interpretive Systems,” *Revue d’économie industrielle* 97, 4e trimestre (2001), p. 25.

[Consider] three actors with different and distinct knowledge sets, all of which are relevant to a particular problem. Assume that these knowledge sets reflect a set of design choices that define a solution landscape to a particular problem and that the landscape is at least somewhat rugged. Each actor can independently develop an ordering for trials based on his or her respective knowledge. However, differences in knowledge are likely to yield differences in cognitive maps and hence the recommended order of [search] trials. Moreover, absent knowledge sharing, these independently developed cognitive maps are unlikely to be well matched to the topography of the solution landscapes. Only by developing heuristics that encompass the knowledge of all actors can the probability of discovering highly valued solutions be advanced.

While individual beliefs are the basis of heuristics that guide group decisions, developing group heuristics requires the resolution of inherent conflicts in beliefs. These group heuristics are shaped not only by the quality of actors' logic, but also by each actor's self interest and political position. Thus, while individual beliefs form the basis of group beliefs or heuristics, not all individual beliefs are equally important or influential in this process.

Heuristic search first necessitates knowledge transfer to facilitate the development of heuristics that derive from multiple and dispersed knowledge sets. Knowledge transfer in turn necessitates the development of a shared language to support it. Finally, the development of group heuristics requires the reconciliation of the divergent beliefs about the proper shape of the search heuristic.²⁴⁶

There is necessarily an important difference between the style of governance required for directional and heuristic search. Directional search simply requires that an agent optimize on a design choice, and observe the outcome. Therefore, with directional search, agents can operate independently. Conversely, heuristic search requires group decision making, which necessitates a coordinated effort.²⁴⁷ As a result, different types of search require different types of governance structures. Before we turn our attention to governance considerations, it is useful to briefly match search type to problem type.

²⁴⁶ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 621.

²⁴⁷ *Ibid.*, p. 621

Directional search is well suited to low-interaction, or decomposable, problems. When there is little interaction among design elements, the only relevant feedback is whether the value of the solution, hence its performance, is superior or inferior with each successive trial. On the other hand, directional search is poorly suited to high-interaction problems. When there is extensive interaction amongst design elements, directional search strategies will often leave problems solvers out in the wilderness, with no map and no sense of where the high value treasure lies.²⁴⁸

Heuristic search methods are naturally well suited to high-interaction, or nondecomposable, problems. When the interaction amongst design elements is high, a cognitive map of the solution space can be highly beneficial. While a workable solution might be found through directional search processes, a cognitive appreciation of the solution map will lead actors to discount searching for low value alternatives, in favour of searching in a space where high value solutions are more likely to be found.²⁴⁹

Moderate-interaction problems can benefit from both directional or heuristic search patterns, depending on the degree of interaction between design elements. As the level of interaction amongst design elements increases, a heuristic search process becomes more valuable. Similarly, as the level of interaction decreases, directional search becomes more valuable. With moderate-interaction problems, it is often helpful to use a heuristic search tool to define the area of the landscape where solutions are most likely to appear, and then use directional search to methodically search that area. Adopting Nickerson and Zenger's language, cognitive maps are useful for "discovering the regions of the solution landscape particularly attractive

²⁴⁸ The implication here, recalling Figure 5, is that actors could be searching in the space defined by the rectangle ABCD.

²⁴⁹ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 621.

for search, while directional search involving independent actors effectively explores these regions.”²⁵⁰

INCENTIVE PROBLEMS AND KNOWLEDGE HAZARDS

If different types of problems demand different search strategies, then decision makers are naturally compelled to identify appropriate governance structures to guide these processes. As will be demonstrated, the optimal governance system for low-interaction, decomposable, problems is a relatively straightforward issue. However, high-interaction problems, which benefit, if not require, heuristic search, present a number of challenges. These challenges, or hazards, include knowledge appropriation, knowledge accumulation, and knowledge destruction (expanded upon below). Overcoming these hazards, through appropriate governance structures, is critical to facilitate heuristic search.

The first knowledge hazard identified by Nickerson and Zenger, appropriation, is fundamentally an incentive problem.²⁵¹ Heuristic search requires independent actors to share information, but there is little incentive for individual actors to behave benevolently. This famous paradox, identified by Kenneth Arrow,²⁵² works as follows: “The value of knowledge to its potential acquirer is not known until after the knowledge is revealed; however, once that value is revealed, the potential acquirer has no need to pay for it and can resell it at near zero marginal cost.”²⁵³ The incentive problem is that individuals are naturally predisposed to assimilate the knowledge of others, extracting its value, while revealing nothing. Each individual, therefore, is prone to knowledge hoarding. Each individual, acting in his or her own

²⁵⁰ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 621.

²⁵¹ *Ibid.*, p. 622.

²⁵² Kenneth J. Arrow, "Information and Economic Behavior," *Stockholm, Federation of Swedish Industries - Reprint of Nobel Prize Paper 28* (1973): 1-34.

²⁵³ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 622.

self-interest, can make knowledge sharing exceedingly difficult, if not impossible. While property rights and contracts can to some degree alleviate the incentive problem, the nature of knowledge heuristics developed in group settings makes this exceedingly difficult.²⁵⁴

The knowledge appropriation hazard has important implications for heuristic search, which requires extensive knowledge sharing. Directional search, on the other hand, does not require knowledge sharing, and is therefore unaffected by this form of knowledge hazard.²⁵⁵ The challenge is to construct a governance system appropriate for heuristic search and high-interaction problems, which overcomes the knowledge appropriation hazard.²⁵⁶

The second knowledge hazard identified by Nickerson and Zenger involves knowledge accumulation by individuals, and is similarly an incentive problem. In addition to hoarding knowledge, actors are naturally predisposed to shape knowledge formation and discovery to serve their own ends. Each individual, naturally, has the capacity to influence, or strategically alter, the heuristic guiding group search. Individual actors, with an incentive to accumulate knowledge that is beneficial to them, can shape the search heuristic in a way that optimizes the likely of discovering interactions/solutions that adds uniquely to their value stock of knowledge. As Nickerson and Zenger note:

²⁵⁴ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 622.

²⁵⁵ While directional search does not require 'knowledge sharing' *per se*, this form of search does facilitate knowledge transfer through other means. Once solutions are developed, any actor can examine the work *ex post*, and add this information to his stock of knowledge. Here, knowledge transfer occurs through markets and prices in the Hayekian sense. For more on this topic, see: F. A. Hayek, "The Use of Knowledge in Society," *The American Economic Review* 35, no. 4 (1945), pp. 519-530; Nicolai J. Foss, "The Use of Knowledge in Firms," *Journal of Institutional and Theoretical Economics* 155, no. 33 (1999), pp. 458-486; Nicolai J. Foss, "Misesian ownership and coasian authority in hayekian settings: The case of the knowledge economy," *Quarterly Journal of Austrian Economics* 4, no. 4 (2001), pp. 3-24.

²⁵⁶ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 622.

[Actors] have incentives to strategically influence the pattern of [search] trials in ways that enhance their specialized knowledge or complement knowledge that they already possess, while avoiding efforts that require knowledge sharing. Consequently... efforts to explore problems requiring heuristic search are likely to lead to attempts to distort cognitive maps, to conflicts regarding the proper ordering of trials, and more generally to an underinvestment in knowledge sharing activities that facilitate the development of common heuristics.²⁵⁷

While the knowledge accumulation hazard is largely irrelevant for decomposable, low-interaction, problems that do not require knowledge sharing, there are important governance implications for high-interaction problems. Put another way, as problem complexity increases, moving from low to high-interaction, different governance mechanisms are necessarily required to mitigate knowledge exchange hazards.²⁵⁸

In addition to the two knowledge hazards identified by Nickerson and Zenger, a third and final hazard deserves attention: knowledge destruction. The development of a shared search heuristic necessitates individuals with distinct knowledge sets of different design interactions coordinating their knowledge and learning from each other. The knowledge set that each actor brings to the table, once shared and aggregated, forms the embedded knowledge of an organization.²⁵⁹ The process of developing embedded knowledge, and through it, a search heuristic, is not immediate. It takes individuals time to learn, share, and process information. Necessarily, the embedded knowledge of an organization is not static. When new individuals enter an organization, embedded knowledge evolves. Similarly, when individuals exit an organization, embedded knowledge can evaporate. The development of a heuristic search tool, that is product of embedded knowledge,

²⁵⁷ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 622.

²⁵⁸ *Ibid.*, p. 622.

²⁵⁹ For a thorough discussion of knowledge manifests itself within organizations, see: Alice Lam, "Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework," *Organization Studies* 21, no. 3 (2000), pp. 487-513, and Nicolai Foss, Kenneth Husted and Snežina Michailova, "Governing Knowledge Sharing in Organizations: Levels of Analysis, Governance Mechanisms, and Research Directions," *Journal of Management Studies* 47, no. 3 (2010), pp. 455-482.

necessarily changes when actors join or exit an organization. Therefore, during the search process, when the solution landscape is being examined, actors leaving an organization can destroy (to some degree) the search heuristic, decreasing the likelihood of uncovering valuable solutions. The implication of the knowledge destruction hazard is that organizational durability, particularly during the search process, is critically important.

Before we complete our review of the framework and map the appropriate governance structures to problem type and search type, it is useful to briefly summarize the terrain covered thus far. We began with the 'problem' as the primary unit of analysis, of which there are three types: (1) low-interaction, decomposable; (2) moderate-interaction, nearly decomposable; and (3) high-interaction, nondecomposable. Moreover, the framework suggests that there are two types of search, directional and heuristic. The efficiency of organizing a search, hence the ordering of search trials, is a match between problem type and search type, which necessarily dictates the organizational form and appropriate governance mechanisms. Finally, we have identified three knowledge hazards, appropriation, accumulation, and destruction, that manifest themselves predominantly during heuristic group search.

MATCHING PROBLEM TYPE AND SEARCH TO ORGANIZATIONAL GOVERNANCE

As demonstrated, different problems require different search procedures. As will be seen in this section, different search procedure can be linked to different organizational forms to efficiently locate valuable solutions. To simplify the analysis, it is assumed that there are three separate prototypical organizational forms:

outsource-markets (OM), insource-Weberian administration (IWA), and insource-agency administration (IAA).²⁶⁰

As illustrated in Figure 6,²⁶¹ each of these organizational forms are associated with different cost structures to find a solution.

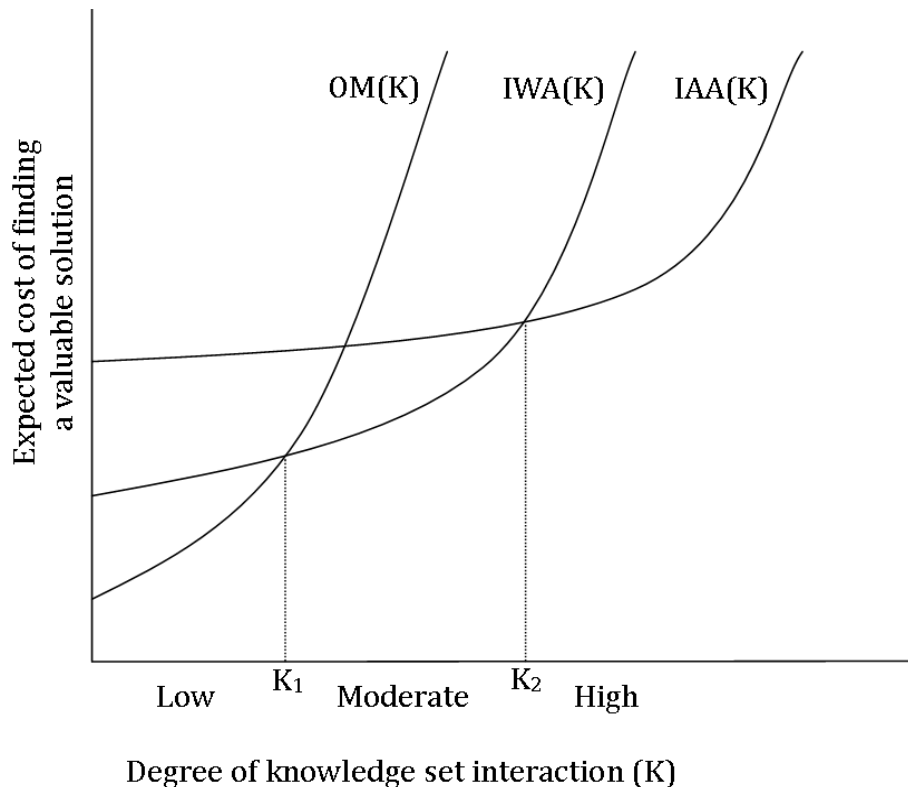


FIGURE 6 - RELATIONSHIP BETWEEN GOVERNANCE AND DESIGN SET INTERACTION

For problems where there is limited interaction among design elements, the OM structure is the lowest cost alternative to find a solution. When problems have moderate levels of interaction among design elements, the IWA structure is the

²⁶⁰ Nickerson and Zenger are primarily concerned with the organizational forms of firms. In their model, markets are analogous to OM, authority-based hierarchies are analogous to IWA, and consensus-based hierarchies are analogous to IAA. We have, in effect, translated their model to make it directly applicable to the study of government. For more, see: Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, pp. 622-627.

²⁶¹ This figure has been largely reproduced. Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 627.

lowest cost alternative to find a solution. The same logic applies to problems with high levels of interaction among design elements, and IAA. Thus, Figure 6 suggests that different organizational structures are called for depending on the nature of the problem under investigation.

The rest of this section examines in greater detail the costs associated with each of the organizational structures, and provides a rationale for the shape and position of the curves in Figure 6. As will be shown, costs are linked to three factors: (1) decision rights over the path of search, (2) communication channels to support knowledge transfer, and (3) incentives to motivate search. How does government align these three organizational forms to problem type, while also addressing the knowledge hazards endemic to heuristic search? We now turn our attention to this question.

Like any organization in society, government has the choice to insource or outsource activity. They can locate solutions to problems within the boundaries of government, or look to the outside world for answers. When governments are faced with low-interaction problems, the most efficient organizational form is outsource-markets (OM). With this form of governance, government acts as a contractor, or purchaser, of solutions that are developed in the market. By taking advantage of the incentive structures imbedded in markets, governments can ensure that multiple independent actors compete to provide valuable solutions, at the lowest possible cost. In many ways, the OM form of governance parallels the New Public Management (NPM) way of thinking, following the edict that government should be 'steering, not rowing.'²⁶² Within the OM framework, government continues its traditional role of defining the solution being sought, however the means to achieve the solution is left to independent actors operating outside the boundaries of the state.

²⁶² For a popular account of the NPM philosophy, see: David Osborne and Ted Gaebler, *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector* (New York: Plume, 1993).

Markets and prices, in the Hayekian sense, are invaluable because they dispense with the need for conscious control. In this framework, OM effectively determines the path of search through decentralized controls, while the price mechanism affords high-powered incentives that motivate self-interested actors to search for valuable solutions. The OM form of governance is well suited to governing directional search. Directional search requires high-powered incentives to ensure actors pursue solution trials, which are embedded in markets. Moreover, directional search does not require immediate knowledge sharing, which markets inherently fail to facilitate, or perhaps more accurately, actively discourage.²⁶³ OM, therefore, actively avoids the three knowledge hazards, appropriation, accumulation, and destruction.²⁶⁴

While OM are an extremely effective tool for governing directional search, they function poorly when it comes to heuristic search, which requires knowledge sharing. For OM to work with heuristic search, independent actors would have to contractually agree on search patterns, the performance of the search, and a host of other considerations. The cost to effectively manage heuristic search through OM/contracts, including the cost of resolving disputes through legal means, makes this form of governance particularly ill suited for heuristic search, and therefore, for locating solutions to complex problems.

When faced with moderate-interaction problems, where a combination of heuristic and directional search strategies are desirable, the framework suggests that insource-Weberian administration (IWA) is the most appropriate form of governance. IWA is simply the traditional, hierarchical, administrative apparatus that is common in most western liberal democratic states. From the parlance of

²⁶³ Once a solution is developed and sold, *ex post* knowledge sharing (or acquisition) is likely to occur. With OM, independent actors necessarily seek to protect their knowledge/solutions until government has acquired them.

²⁶⁴ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 623.

government, IWA is the stereotypical 'line department'.²⁶⁵ With IWA, actors are organized in the form of a pyramid, with authority over decision rights located at the top, and communications channels operating along vertical lines.

IWA, in the problem-solving context, is valuable because it confers authority on one actor to identify the ordering of trials. Unlike market processes (OM type governance), authority embedded in a decision maker circumvents the need to contractually manage the ordering of trials. By bundling knowledge sets within government and using authority, decision makers can economize on the extensive and costly knowledge sharing required to solve moderately complex problems. On the face of it, IWA appears well suited to govern heuristic search. In this form of governance, a decision-maker can define the critical knowledge interactions, develop suitable heuristics to guide search, and in effect, narrow the area of the solution landscape requiring investigation.²⁶⁶

While IWA certainly supports heuristic search in some forms, it does so at the expense of dampening incentives that motivate and reward directional search and knowledge accumulation under OM. Within the boundaries of the government, employees (or actors) grant managers (or decision makers) authority in exchange for wages. This contractual relationship, between labor and wages, has two distinct benefits. First, it severs the direct linkage between the knowledge employees accumulate and wage they receive, dampening the incentive to strategically accumulate knowledge. While employees can exit government and expropriate some of the accumulated knowledge, there is now an opportunity cost in terms of lost wages, creating a disincentive to walk away. Second, within the boundaries of the government, and with this contractual relationship, the courts exercise

²⁶⁵ In the context of the Government of Canada, IWA would accurately describe the governance structure of most traditional line departments; for example, Health, Industry National Defence, etc. For more, see: Gregory Tardi, "Departments and Other Institutions of Government," in *The Handbook of Canadian Public Administration*, ed. Christopher Dunn (Toronto: Oxford University Press Canada, 2002), pp. 281-304.

²⁶⁶ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 624.

forbearance, refusing to hear internal organizational disputes. Forbearance grants decision-makers authority within government, and thus employees have limited capacity and motivation to manipulate the path of search. As such, insource-Weberian hierarchies are effective, to a significant degree, in minimizing knowledge hazards.²⁶⁷

IWA is superior to OM in supporting heuristic search, but inferior in supporting directional search. The use of authority within hierarchies (IWA), therefore, is well suited to nearly decomposable, moderate-interaction problems. As problems become less complex, and more decomposable, OM is preferable. Similarly, as problems become very complex, and nondecomposable, the authority mechanism within government fails to facilitate horizontal knowledge sharing, leading to sub-optimal outcomes. With high-interaction problems, it is highly unlikely that a manager has the requisite knowledge and cognitive capacity to exclusively define search and direct the action of subordinates. In this case, an optimal search heuristic requires horizontal communication, which IWA is designed to impede.²⁶⁸ As Nickerson and Zenger note:

[IAW] provides an important advantage over [OM] in directing the search for solutions the more nondecomposable the problem. However, the limits to this governance solution are reached as the level of knowledge interactions escalate and the cognitive capacity of a single individual to assemble the required specialized knowledge reaches its limits.²⁶⁹

When governments are faced with high-interaction problems, and heuristic search strategies are required, an alternative form of governance, located within the boundaries of government, yet necessarily distinct from IWA, is called for. This form of governance must support heuristic search through horizontal communication and

²⁶⁷ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 625.

²⁶⁸ *Ibid.*, p. 625.

²⁶⁹ *Ibid.*, p. 625.

consensus decision-making, necessitating the development of a unique organizational identity, or code.²⁷⁰ The framework suggests that government can effectively undertake heuristic search by adopting the in-source-agency administration (IAA) form of governance.

As the name implies, the IAA form of governance suggests that government establish a separate agency (hence, an organization) that has unique characteristics. The intellectual roots of IAA are found in Kogut and Zander's research,²⁷¹ in which they describe the firm (or in our case, an agency) as a specialized social community that creates, shares and transfers knowledge more efficiently than markets. Here, the agency is a tool that supports horizontal knowledge transfer and advances shared heuristics that guide decision making within government. Critically, horizontal knowledge transfer facilitates a consensus reflection of specialized knowledge sets of individual actors, resulting in a collective, and consensus, decision making process that guides search. Obviously, within the boundaries of the government, IAA type decision making is at the polar opposite of IWA type decision making. In order to be successful, IAA requires a number of distinct structures and incentives that can overcome knowledge exchange hazards, while ensuring that actors behave with a common sense of purpose.²⁷²

Consensus requires knowledge sharing, and thus a commonly shared language and identity government. Agencies can be useful to develop information channels, and organizational codes, which fosters a government specific identity, and lowers the barriers and costs of communication coordination.²⁷³ Developing and fostering an

²⁷⁰ 'Increased likelihood', in this context, suggests that the probability of finding a valuable solution is above what could be expected with the selection of random search trials.

²⁷¹ See: Bruce Kogut and Udo Zander, "Knowledge of the Firm, Combinative Capabilities and the Replication of Technology," *Organization Science* 3, no. 3 (1992): pp. 383-397. and Kogut and Zander, *What Firms do: Coordination, Identity, and Learning*, pp. 502-518.

²⁷² Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 626.

²⁷³ For more on how 'codes' socialize actors to employ similar language, beliefs and practices within organizations, see: James G. March, "Exploration and Exploitation in Organizational Learning," *Organization Science* 2, no. 1 (1991), pp. 71-81.

organizational code and identity is both an expensive and time-consuming enterprise. As Kenneth Arrow noted, government²⁷⁴ investments in channels and codes are not only actor specific, but when aggregated, represent invaluable social capital for the organization. Through this accumulated capital, manifested in an organizational identity, informal rules (norms) help coordinate the direction of search. With IAA, government will expend considerable resources to socially condition employees and develop relationships that ease knowledge transfer, facilitate agreement, and discourage internal exploitation of knowledge and search.²⁷⁵

Within insource-agency administration, incentives and dispute mechanism must necessarily be engineered to support knowledge transfer and consensus-based decision making. Logically, low-powered incentives for individual actors are essential for consensus decision making, because they encourage knowledge sharing (or do not encourage knowledge hoarding). As such, IAA requires government to pay substantially higher base wages, and provide employees with considerable job security, to ensure their participation in the collective enterprise. Similar to IWA, forbearance by the courts is central to IAA. However, dispute resolution with this form of governance is also mediated by the organizational code, which discourages exploitation and conflict by agents, and ensures individual actors come together and collectively decide the path of search.²⁷⁶

While IAA appears preferably to IWA when conducting any type of heuristic search, it is only appropriate for highly complex problems. As Nickerson and Zenger note, “the costs associated with supporting extreme levels of knowledge transfer are substantial and become unwarranted as problems diminish in their complexity.”²⁷⁷ Simply put, the organizational costs for achieving consensus are high. As problems

²⁷⁴ While Arrow was focused on firms, the same logic applies to government.

²⁷⁵ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 626, 627.

²⁷⁶ *Ibid.*, p. 627.

²⁷⁷ *Ibid.*, p. 627.

move from high-interaction to moderate-interaction, hence as they become less complex, less costly organizational forms are desirable. Moreover, as IAA requires low-powered incentives to ensure knowledge transfer, the side effect is a natural constraint on the motivation of actors within the government to develop new knowledge, and search for solutions. Therefore, while IAA as an organizational form is highly appropriate for nondecomposable problems, their cost structures suggest they should only be adopted in highly appropriate situations.²⁷⁸

THE FRAMEWORK AND ALIGNMENT – PROBLEMS, SEARCH AND GOVERNANCE

It is useful to refer back to Figure 6 and explicitly review the discrete alignment between the search needs of problems, and search costs and performance of the different organizational forms. In the Figure, the stylized costs of the three organizational alternatives are matched over a range of problems that vary in the degree to which design choices interact. For sake of simplicity, the horizontal axis in Figure 5 is a continuous measure of the degree of design set interaction, holding the number of design elements constant. The vertical axis represents the expected cost to government of finding a valuable, or workable, solution.²⁷⁹

As Figure 6 clearly illustrates, OM most efficiently governs low-interaction problems, IWA most efficiently governs moderate-interaction problems, and IAA most efficiently governs high-interaction problems. Outsource-markets effectively promotes knowledge specialization and directional search, which are highly suited to low-interaction problems. However, knowledge accumulation and knowledge appropriation hazards ensure that the cost of OM governance (indicated in Figure 6 by $OM(K)$) increases rapidly as the degree of design set interaction increases. For low-interaction problems, the cost of insource-Weberian administration (indicated

²⁷⁸ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 627.

²⁷⁹ *Ibid.*, page 627.

in Figure 6 by IWA(K)) is greater than markets, reflecting the inability of authority to efficiently incentivize directional search. As problem complexity increases, from low-interaction to moderate-interaction (indicated in Figure 6, points between K_1 and K_2) the relative cost of IWA decreases, suggesting that IWA is the most efficient organizational form to conduct search.²⁸⁰ Similarly, as problems become ever more complex, the costs of IWA increase rapidly as managers lack the necessary knowledge and capacity to effectively guide search. Therefore, as problem complexity increases, from moderate-interaction to high-interaction, the relative cost of insource-agency administration (indicated in Figure 6 by IAA(K)) decreases. Therefore, IAA is the appropriate form of governance with levels of interaction greater than K_2 .²⁸¹ To summarize the appropriateness of problem, search, and governance type, refer to Table 1 (see following page).²⁸²

THE FRAMEWORK AND THE ERH PROJECT

At the outset of this chapter, we identified the need for a framework to help us think about the design phase of the Ontario EHR project. Recall that during this phase of the EHR initiative, the government of Ontario split the project into two distinct parts (or two problems that required attention). The SSHA, a newly established government agency, was tasked with developing a solution to the network infrastructure problem, while the MOHLTC, a traditional line department, was tasked with solving the software problem. Were these two styles of organization appropriate to solve these particular problems? If not, what were the implications for the ultimate success of the EHR project? With the framework now firmly in

²⁸⁰ The cost curves in Figure 5 are all upwards sloping, which intuitively suggests that OM is the most desirable (lowest cost) form of governance. However, recall that the highest peak of the solution landscape, hence the most valuable solution, increases with knowledge set interaction. Therefore, the relevant issue is finding the lowest governance cost for any given problem. For more, see: Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, p. 627, 628.

²⁸¹ Nickerson and Zenger, *A Knowledge-Based Theory of the Firm - the Problem-Solving Perspective*, pp. 627, 628.

²⁸² *Ibid.*, p. 627.

place, we can turn our attention to a detailed analysis of the project, in order to understand why this worthwhile initiative ended as project fiasco.

TABLE 1

Summary of Theoretical Relationships in the Problem-Solving Approach to Governance

Problem Type	Degree of knowledge set interaction (K) among subproblems	Appropriate search mode	Need for knowledge transfer	Knowledge hazards	Optimal governance form
Decomposable	Low	Directional	Low	Low threat	Outsource-markets (OM)
Nearly Decomposable	Moderate	Directional and Heuristic	Moderate	Moderate threat	Insource-Weberian administration (IWA)
Nondecomposable	High	Heuristic	High	High threat	Insource-agency administration (IAA)

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Chapter Six

An Analysis of Ontario's EHR Project

In chapter three we described the Ontario EHR initiative, one of the more interesting Canadian examples of a project fiasco. Despite the public nature of this fiasco, relatively little attention has been paid as to why the project failed to deliver on its promise. Notwithstanding the investigation by Ontario's Auditor General, the analysis of the fiasco, to the extent that it exists, appears superficial. To facilitate a more nuanced analysis, the preceding chapters developed two frameworks to help us think about the design phase, and the implementation phase, of Ontario's EHR project. In this chapter, we apply these frameworks in order to make a more informed diagnosis of the project fiasco.

This chapter begins by briefly reviewing the conventional explanations of the EHR project fiasco, with a focus on the Auditor General's report. The chapter then proceeds in the same fashion as this thesis. We begin with an analysis of the implementation issues facing the EHR project and apply the framework developed in chapter four. Through our analysis, we conclude that the decentralized approach adopted by the province resulted in a number of structural problems for the EHR

project, and helped contribute to the fiasco. We then continue our analysis with a focus on the design phase of the EHR project, applying the framework developed in chapter five, while paying specific attention to the EHR software problem. We argue that the government misdiagnosed the nature of the software problem, and adopted an inappropriate strategy to search for a software solution, contributing to the fiasco. In the final sections of this chapter we summarize the critical error made during the EHR initiative, speculate on why decisions were made, and suggest an alternative approach to organizing such a project.

CONVENTIONAL EXPLANATIONS OF THE EHR PROJECT FIASCO

In chapter two, we identified a number of challenges that jurisdictions outside of Ontario experienced when implementing ehealth systems. While each implementation experience is unique, a few themes emerged including user resistance, uneven adoption, lack of clinician buy-in, and insufficient ICT literacy amongst system users. These ehealth system challenges, in and of themselves, require attention but are unlikely to lead directly to project failure, or worse, fiasco. Nonetheless, it is worth noting that these challenges emerged across Ontario as healthcare organizations tried to implement EHR and EMR systems.²⁸³ Hence, notwithstanding the major issues identified below, Ontario experienced many of the same nuts and bolts problems that have beset other ehealth projects in similar jurisdictions.

²⁸³ For more, see: Nancy Gill, Kevin Leonard and Anthony Jonker, "Does E-Health Adoption Enable Improved Health Outcomes? Encouraging Evidence from Ontario Hospitals," *Healthcare Quarterly* 13, no. 3 (2010), pp. 50-56; Patrick Powers, "Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study," *Healthcare Quarterly* 12, no. 1 (2008), pp. 120-123; John Ronson, "Local Health Integration Networks: Will "made in Ontario" Work?" *Healthcare Quarterly* 9, no. 1 (2006), pp. 46-49. ; Sara Urowitz and others, "Is Canada Ready for Patient Accessible Electronic Health Records? A National Scan," *BMC Medical Informatics and Decision Making* 8, no. 33 (2008).

In October 2009, the Auditor General of Ontario, Jim McCarter, released a special report outlining the systemic problems plaguing the EHR project.²⁸⁴ This report forms the basis of the popular narrative of the EHR project fiasco, and more importantly, why it occurred. In the report, the Auditor identified three critical issues: (1) improper contracting procedures, (2) a lack of project oversight, and (3) the failure to develop a strategic plan.

The first issue involved the SSHA and the MOHLTC, and later eHealth Ontario, failing to follow established procedures for the procurement of goods and the contracting of services. As previously noted in chapter three, the EHR project relied heavily (at some points totally) on the use of outside consultants. By way of example, in 2008, the MOHLTC was engaging more than 300 consultants, with fewer than 30 full-time ministry employees working on the project.²⁸⁵ While the technical nature of the project may have required some degree of specialized consulting advice, the sheer number of consultants employed, and the remuneration they received, was a serious issue of concern. More importantly, as the Auditor noted, the hiring of consultants did follow established procedures, and value-for-money (VFM) was not realized. Much of the public backlash towards the project, captured by sensational media headlines,²⁸⁶ was a direct result of the hiring of preferred consultants, and the abuse of public dollars throughout the project. The circumvention of established protocols was not limited to the hiring of consultants. As the Auditor noted,

²⁸⁴ Jim McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, Toronto: Queen's Printer for Ontario, (2009).

²⁸⁵ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 11.

²⁸⁶ See, for example: Tanya Talaga, "Health Agency Paid Consultants \$2,750 a Day, Documents show; CEO of eHealth Ontario also Got Six-Figure Bonus," *Toronto Star*, sec. A 06, May 29, 2009.; Tanya Talaga, "Critics Roast Government Over \$647M Boondoggle; Ontario's Abandoned Medical e-Records Plan Called a Waste of Cash," *Toronto Star*, sec. A 01, August 8, 2009.; Tanya Talaga, "1 Speech 5 Consultants 3,356 Words the Cost to You \$25,001; 1 Speech, 6 Consultants, 3,319 Words \$24,675.28," *Toronto Star*, sec. A 01, August 8, 2009.; Tanya Talaga, "Time to Move Beyond Scandal, Embattled Health Minister Says; as Controversy Rages Over eHealth Spending, 'Ontario is Behind' on Meeting its Goals," *Toronto Star*, sec. A 21, August 20, 2009.

the allegations that [procurement] contracts were awarded to certain vendors without giving other firms the chance to compete for the business were largely true. In fact, we estimate that two-thirds of the value... of all contracts was sole-sourced.²⁸⁷

The second critical issue identified by the Auditor was the lack of overall political oversight of the EHR project, from conceptualization to realization. The Auditor strongly questioned the political decision to have two entities at arms length from each other develop an EHR solution, with the SSHA working on the network problem, and the MOHLTC working on the software problem. In the Auditor's view, this strategy was inherently problematic, because it depended on both entities cooperating and coordinating their activities. When this failed to materialize, political decision makers largely failed to act. It was not until 2008, when serious problems emerged, that the project was completely reorganized, and all problem-solving activities became the responsibility of one agency, eHealth Ontario. Much of the EHR project failure, according to the Auditor, can be explained by a lack of oversight, with decision makers asleep at the switch while the project drifted and expended hundreds of millions of dollars.²⁸⁸

The final major criticism identified by the Auditor involved a lack of strategic planning for the EHR project. While the project was formally launched in the early 2000s, the government failed to develop an upfront strategic plan, leaving different units within the healthcare system to their own devices. For example, while the government established the SSHA to develop a solution to the network problem, it was never clear how this network ought to work with the MOHLTC's software solution, or how healthcare stakeholders and the general public would be able to functionally use and access the network. The issues arising from not having an initial strategic plan were compounded by a failure to develop one in subsequent

²⁸⁷ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 11.

²⁸⁸ *Ibid.*, pp. 9, 10, 21-24.

years.²⁸⁹ It was not until 2009 that the government of Ontario produced its first ever eHealth strategic plan, and as Auditor noted, “although we welcome the plan, it is an overall Health strategic plan, not an EHR plan.”²⁹⁰ From 2000 to 2010, the period under investigation, one of the largest government projects in Ontario, a billion dollar initiative, operated without a strategic plan.

The three major issues identified by the Auditor General certainly help to shed light why the EHR initiative resulted in a project fiasco. It is hard to argue that a lack strategic planning, a lack of political oversight, and improper contracting procedures did not engender a climate conducive to fiasco. Nevertheless, the analysis and critique offered by the Auditor is in many ways superficial. Clearly, the absence of a strategic plan, in and of itself, is a cause for concern. However, it does not follow that if a strategic plan had existed, the project would have succeeded. Hence, while the lack of strategic plan has been invoked as a rationale to explain the fiasco, more important questions have not yet been answered: What would an effective strategic plan have looked like? How should the government of Ontario have approached the problem of managing the vast amounts of patient information in the healthcare system? What were the consequences of the approaches undertaken by the SSHA, the MOHLTC, and eHealth Ontario? A similar logic can be applied to the issue of contracting procedures. Hence, notwithstanding improper procedures, was it appropriate, in the first place, to rely on the use of outside consultants to help facilitate the search for an EHR solution? In what follows, we implicitly suggest that all of the issues raised by the Auditor can be addressed more thoroughly through an analysis of the implementation and design phases of the EHR project.

²⁸⁹ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, pp. 18-20

²⁹⁰ *Ibid.*, p. 8.

THE IMPLEMENTATION PHASE AND THE DECENTRALIZED APPROACH

In chapter four, we employed a game theoretic framework to examine two different types of solutions, *independent* and *interdependent*. We concluded that EHR solutions are interdependent, which suggests that actors in the healthcare system ought to cooperate and coordinate on one solution. By looking at implementation considerations first, it is reasonable to suggest that the government of Ontario should have focused all its energies on developing one interoperable EHR system for the province.

One of the curious features of the EHR project was the decentralized approach adopted by the province to develop a solution to the patient information management problem. As multiple commentators have demonstrated, the decentralized governance approach resulted in independent organizations each developing their own EHR systems, which although functional, are not interoperable.²⁹¹ As of 2010, the Canadian Medical Association (CMA) notes that there are at least twenty (non-interoperable) EHR systems operating across Ontario in different LHINs, specialized agencies, and hospital networks.²⁹² As demonstrated in chapter four, it is more beneficial, *ceteris paribus*, for the healthcare system as whole to operate with only one EHR system. The history of the EHR project, and in particular the decentralized approach adopted by the province, raises three questions: (1) Why did independent healthcare organizations fail to cooperate and coordinate on one EHR system? (2) What were the implications of the decentralized approach? We address these questions in turn. The larger question (3), of why the government chose to adopt the decentralized approach, will be considered near the end of this chapter.

²⁹¹ Hugh MacLeod and others, "The Times they are A-Changing: What Worked and what we Learned in Deploying Ontario's Wait Time Information System," *Healthcare Quarterly* 12, no. Special Issue (2009), pp. 8-15; Powers, *Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study*, pp. 120-123.

²⁹² "Ontario's Plan for Electronic Health Records is at Risk, Official Says," *Canadian Medical Association Journal*, 2010.

The answer to the first question is obvious: independent healthcare organizations failed to cooperate and coordinate because it was in their own self-interest, and because the MOHLTC encouraged this behavior. In chapter four, we explored how government can exercise its authority to facilitate cooperation and coordination on interdependent solutions. We suggested that government could be proactive, and use either incentives or rules to facilitate the adoption of one EHR system. However, it also true that government can establish incentives that discourage cooperation and coordination. During the EHR project, the government provided a set of financial incentives to local healthcare organizations to develop their own EMR and EHR systems. Moreover, formal governance agreements, like the Hospital Accountability Agreements (HAA), specifically tied funding to the development and adoption of local EHR solutions.²⁹³ Not surprisingly, self-interested healthcare organizations developed EHR/EMR systems that suited their own unique needs, without consideration to what other healthcare organizations were doing. In effect, the government got the incentives backwards, encouraging (consciously or unconsciously) the development of independent EHR solutions. As the analysis in chapter four suggests, independent healthcare organizations, left to their own devices, will coordinate internally on one EHR system. However, once EHR systems are operational, independent organizations will fail to cooperate. What is surprising is that the government of Ontario discouraged (consciously or unconsciously) independent healthcare organization from cooperating by actively supporting (with money) their independent EHR solutions. It is worth noting that the MOHLTC was not the only player encouraging (hence, incentivizing) this uncooperative behavior. Infoway, the federal agency responsible for ehealth, exacerbated the problem by funding independent EMR and EHR projects across the province.

²⁹³ David Reeleder and others, "Accountability Agreements in Ontario Hospitals: Are they Fair?" *Journal of Public Administration Research and Theory* 18 (2006), pp. 161-175; Ali R. Tawfik-Shukor, Niek S. Klazinga and Onyebuchi A. Arah, "Comparing Health System Performance Assessment and Management Approaches in the Netherlands and Ontario, Canada," *BMC Health Services Research* 7, no. 25 (2007), pp. 1-12.

What were the implications of the decentralized approach adopted by the province? First, we can consider costs. Recall that the government of Ontario was spending millions of dollars on its own central EHR solution, while simultaneously spending millions more on the systems of local (publically funded) healthcare organizations. As the CMA noted in 2010, the cost of developing one these local systems is upwards of \$100 million.²⁹⁴ With over twenty independent EHR systems now operating across Ontario, it is likely that government of Ontario has effectively spent billions dollars trying to develop an EHR solution.²⁹⁵

The second implication is that these twenty independent systems necessarily detract from each other. Recall our extended discussion in chapter four, which demonstrated that failure to cooperate on one EHR solution resulted in a significant loss of benefit to the healthcare system. By adopting a decentralized approach, the government of Ontario virtually ensured that multiple systems would be constructed, and that the potential value, or net benefit, of these systems would not be realized. The problematic nature of this decentralized approach can be illustrated by a simple example. Consider a person from Sudbury, who has an electronic patient record stored in the North East LHIN EHR system. This person uses the healthcare system regularly, and is allergic to number of drugs. While on vacation in Kingston, the person gets sick and arrives unconscious at the emergency department of the local hospital. The Kingston hospital, which uses the South East LHIN EHR system, cannot get access to the persons' medical record, because its system is not interoperable with the North East LHIN EHR system. The doctors treat the person using conventional methods, but a drug reaction occurs, resulting in anaphylactic shock and death. If the systems had been interoperable, the doctors would have treated the patient differently, preventing an unnecessary death. The implication of this example is that developing one EHR system, however imperfect, and

²⁹⁴ *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, pp. 253-254.

²⁹⁵ Employing the CMA estimate, we can infer that the net cost of these twenty systems was roughly \$2 billion. In additional, the government of Ontario spent roughly \$1 billion on the central EHR project. All things considered, between 2000 and 2010, we can infer that the net cost to the public purse for the EHR project was roughly \$3 billion.

aggregating all records into that system would ultimately be more effective for the healthcare system.

It is worth noting that by late 2007, some policy analysts at the MOHLTC clearly realized the predicament they had created by virtue of a decentralized approach. A draft plan, created by the MOHLTC, was circulated to expand the EHR system used by the Hospital[s] for Sick Children, eCHN. Under that plan, the eCHN solution would have become the universal EHR system for the province, and all healthcare organizations would have been forced to adopt it.²⁹⁶ Therefore, at some level, analysts were considering the long-term EHR implementation problems plaguing the healthcare system. However, for reasons unexplained, this plan was never adopted. The government simply continued to encourage independent healthcare organizations to develop their own EHR solutions, and therefore discouraged (or did not actively encourage) these organizations to cooperate.

By failing to fully consider the implementation phase of the project, and the interdependent nature of EHR solutions, the government generated a host of problems. With the benefit of hindsight, it is clear that a strategic plan, which takes into account the implementation phase of the EHR project, would have suggested that the government fund the development of only one system. Moreover, a prudent plan would have established a set of incentives to dissuade independent organizations from developing their own EHR solutions. Alternatively, the plan could have suggested that the government simply legislate a solution, establishing a rule whereby publically funded healthcare organizations were not allowed to develop their own ehealth systems.²⁹⁷ In either case, an effective strategic plan

²⁹⁶ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 18.

²⁹⁷ While the rules based expression might appear draconian, it is the approach currently being advocated by Doug Tessier, the Senior VP of Development and Implementation at eHealth Ontario. Tessier argues that once a central system is fully operational, the government should legislate, or regulate, its compulsory use. For more, see: *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, pp. 253-254.

ought to consider, or ensure, that all actors in the healthcare system cooperate and coordinate on one EHR solution.

With our analysis of the implementation phase of the EHR project complete, we turn our attention to the design phase, and the activities undertaken by the SSHA, the MOHLTC, and eHealth Ontario. Recall that the government of Ontario adopted a dual tract approach to the project, simultaneously funding the design of a central EHR system, and many independent EHR and EMR systems across the province. If our analysis of the implementation phase is correct, and the cornerstone of an effective EHR solution is one system, then it is worth investigating how the government approached the centralized effort. Therefore, in what follows, we apply the framework developed in chapter five to the design phase of Ontario's EHR project.

THE DESIGN PHASE AND THE ELECTRONIC NETWORK PROBLEM

During the design phase of the project, the government of Ontario made an ostensibly reasonable decision to split the EHR project into two distinct parts: a network problem, and a software problem. In this section we apply the framework developed in chapter five to the network problem, leaving software problem consideration for later.

In 2002, the government of Ontario established a crown agency, the SSHA, to address two interrelated parts of the EHR project. As previously noted, the SSHA was given the task of developing a secure electronic network on which patient data (the software) could travel, and providing terminals (or access points) from which users could input and retrieve patient data.²⁹⁸ The first step in applying the framework developed in chapter five is to diagnose the nature of network problem – i.e., whether it was decomposable, nondecomposable, or nearly decomposable problem.

²⁹⁸ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 5.

Acquiring, or developing, a new secure electronic network and the associated terminals, it can be argued, is a decomposable problem. The network component of the problem involved a set of interchangeable pieces, including fiber optic cables, network cards, hubs, bridges, circuits, switches and routers. Between 2002 and 2004, the SSHA outsourced its responsibilities to a number of commercial providers, who facilitated procurement and operational considerations. During this period, the SSHA simply acted as a service coordinator.²⁹⁹ Once the core pieces of the network were connected, a secure private network was established.³⁰⁰ In the period after 2004, the SSHA mission changed. In order to more successfully meet the needs of the broader healthcare community, the SSHA moved to an in-house infrastructure development model, and took over responsibility for operating the network.³⁰¹ While this network problem is decomposable, it does not suggest that the solution is necessarily cheap. Developing a private network is very expensive, particularly on the scale required for one of the world's largest healthcare systems.

The framework outlined in chapter five suggests that when government tries to locate solutions to decomposable problems, they should adopt the outsource-markets (OM) form of governance. In some ways, the government of Ontario adopted this approach, insofar as they contracted solutions for the various parts of this decomposable problem. However, the government initially chose to establish a separate crown agency, with its own bureaucracy, to facilitate the contracting. What is particularly curious about this decision was that the SSHA did not operate as a traditional independent agency. As the 2006 Operational Review noted, "the advantages offered by an agency construct have been diminished by the SSHA

²⁹⁹ Ministry of Health and Long Term Care, Government of Ontario, "Smart Systems for Health Agency, Operational Review, Final Report," Toronto: Queen's Printer for Ontario, (2009), p. 15.

³⁰⁰ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 21.

³⁰¹ Ministry of Health and Long Term Care, Government of Ontario, "Smart Systems for Health Agency, Operational Review, Final Report," Toronto: Queen's Printer for Ontario, (2009), p. 15.

operating more as a Ministry division than an independent agency.”³⁰² It is unclear from the evidence why the government went to great lengths to establish a new organization and bureaucracy (the SSHA) to effectively duplicate the work that could have been facilitated within the MOHLTC.

While not specifically outlined in chapter five, we can infer from the framework that an independent agency form of governance would be able to locate solutions to decomposable problems, albeit at an inflated cost. Put another way, an agency form of governance is an expensive approach to undertake a search for solutions to this type of problem. In 2009, the Auditor noted that the SSHA received an inordinate share of the blame for the EHR project fiasco, despite delivering on its promise (i.e. a functional network).³⁰³ While the Auditor criticized the costs associated with developing a solution to the network problem, a solution was delivered. With the benefit of hindsight, the network problem should have been approached differently during the design phase of the project. A coherent strategic plan would have suggested that the OM form be employed to solve this problem. Therefore, the government should have contracted for the core components of the network as they did between 2002-2004, while leaving coordinative and operational aspects to the MOHLTC. Moreover, each independent healthcare organization should have contracted for their own terminals, acquiring solutions that best fit their internal needs.

Our focus in this section has been on the network problem, and determining the appropriateness of establishing an independent agency to locate a solution. However, it is also important to note that decisions taken in relation to the network problem generated two negative, and unintended, consequences. First, the SSHA

³⁰² To be specific, the funding formula for the Agency was tied to the provincial Results Based Planning initiative, traditionally used to allocate funds to line departments. The SSHA, therefore, did not have the room to truly operate independently, despite looking (and frequently acting) like an independent crown agency. For more, see: Ministry of Health and Long Term Care, Government of Ontario, “Smart Systems for Health Agency, Operational Review, Final Report,” Toronto: Queen’s Printer for Ontario, (2009), p. 3.

³⁰³ McCarter, *Special Report: Ontario’s Electronic Health Records Initiative*, p. 9.

was tasked with developing an entirely new private network. Therefore, a decision was made to forgo using the Internet, a considerably cheaper alternative (virtually free), as it was deemed insufficiently secure to transmit private health records. The problem with developing a secure network is that only authorized healthcare providers would be connected. The implication, of course, is that individual patients would not be able to access the network, or their records. Therefore, one of the key benefits of EHR systems in general, providing information directly to patients,³⁰⁴ was lost by virtue of this decision.

The second unintended consequence involved mission creep on the part of the SSHA. While the government viewed the SSHA as an IT infrastructure provider³⁰⁵ the agency became actively involved in trying to facilitate the integration of evolving EHR systems at the local level. To this end, the SSHA spawned its own Ontario Health Information Standards Committee (OHISC) and started working (unsuccessfully) with local healthcare organizations.³⁰⁶ To the extent that system integration was a priority for the government, the actions of the SSHA simply complicated matters. Responsibility for coordinating system integration was ostensibly the responsibility of the MOHLTC, which had its own coordinative body, the Ontario e-Health Council. Again, with benefit of hindsight, a coherent strategic plan that located a solution to the network problem from within the MOHLTC, would likely have prevented multiple integrative bodies (i.e. the Council and the Committee) from emerging within the center of government.

THE DESIGN PHASE AND THE SOFTWARE PROBLEM

³⁰⁴ Paul C. Tang and others, "Personal Health Records: Definitions, Benefits, and Strategies for Overcoming Barriers to Adoption," *Journal of the American Medical Informatics Association* 13, no. 2 (2006): 121-126.

³⁰⁵ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, pp. 21.

³⁰⁶ Jeffrey Roy, "E-Health in Ontario: A Multi-Dimensional Governance Transformation," *International Journal of Healthcare Technology and Management* 8, no. 1/2 (2007), p. 69.

In this section, we apply the framework developed in chapter five to the second component of the EHR project design phase, the software problem. We begin by examining the nature of the software problem, then review the organizational approach adopted by the government of Ontario to locate a solution(s), and finally apply the framework to analyze the approach. We conclude that the province misidentified the nature of the software problem, adopted an inappropriate organizational structure to search for a solution, which resulted in a number of problems and contributed to the project fiasco.

As described below, the development of the EHR software was a nondecomposable problem. The solution to this problem involved creating a master patient index, and then aggregating all of the data produced by the healthcare system into this index.³⁰⁷ Consider just one element of this problem: aggregating the 12 million diagnostic images produced every year by the Ontario healthcare system. One challenge is that different MRI machines produce scans in different formats. In chapter three we noted that hospital A might operate MRI machine B, which outputs scans in format C. Similarly, hospital X might operate MRI machine Y, which outputs scans in format Z. This same pattern plays out across Ontario with different types of MRI machines, and other diagnostic imaging tools. Developing one EHR system that can accept thousands of different input formats is exceedingly complicated. The software problem, therefore, had an extremely large number of design elements, which all interacted in a non-simple way.³⁰⁸

The EHR software problem, despite being a technically complicated undertaking, is also complex because presenting the aggregated data involves a series of design element tradeoffs that result from different individual user preference rankings. As Arrow's impossibility theorem dictates, it is impossible to convert the ranked preferences (i.e. – data output preferences) of individuals into a universal ranking of

³⁰⁷ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, pp. 29, 30.

³⁰⁸ Powers, *Canada's E-Health Journey and HIMSS Analytics' Canada Information and Communications Technology Study*, 120-123.

preferences when there are three or more distinct alternatives.³⁰⁹ Therefore, the complexity arises from the tradeoffs required when presenting the data through the software. In order to analyze the tradeoffs, and develop the best possible software to present that data (albeit, a Pareto suboptimal presentation), individuals with different knowledge sets are required to come together. Hence, searching for the (sub)optimal software solution requires a heuristic search strategy.

The ideal solution to the technical nature of this nondecomposable problem would be the development of one tool, or piece of software, that could translate each of these different output formats into a universal, or standardized, format/code that could interact with the master patient index. The tool, therefore, becomes the mechanism through which all health information, in different formats, becomes interoperable. Developing such a tool is a highly complicated affair. It requires different software designers, with specialized knowledge sets, to come together and map the interaction amongst the differing formats and codes used in all legacy system. Given the sheer number of legacy systems operating across Ontario, it is highly unlikely that any one designer would be able to single handily identify all of the software interactions. Put another way, given the complicated technical interactions of the software problem, it is reasonable to assume that a project manager would lack the necessary knowledge and capacity to effectively guide search. Therefore, it can be argued that developing such a tool (on its own) requires the collective knowledge of multiple independent actors, necessitating a (group) heuristic search strategy. Moreover, given the complexity arising from individual user preference rankings, the data presentation component of the software problem would certainly necessitate a heuristic search strategy.

³⁰⁹ To be more precise, it is impossible to convert the ranked preferences of individuals into a universal ranking that is complete and transitive, while also meeting a set of criteria that include unrestricted domain, Pareto efficiency, and the independence of irrelevant alternatives. For more, see: Kenneth Arrow, "A Difficulty in the Concept of Social Welfare," *Journal of Political Economy* 58, no. 4 (1950), pp. 328-346.

While our analysis suggests that the EHR software problem was nondecomposable, we can infer from the actions undertaken by the government of Ontario that they considered it to be a decomposable problem. The province started with the premise that a master patient index, or 'Client Registry', was the cornerstone of the EHR software solution, which would require various inputs. As opposed to creating one software tool to address the format input problem, the MOHLTC created a set of software pieces to deal with different elements of the problem. From 2002-2010, the MOHLTC worked separately on a Diagnostic Imaging System, a Laboratory Information System, a Drug Information System, and an Immunization System. In 2008, the province also created a parallel Diabetes Registry, which would ostensibly work alongside the Client Registry at some point in the future. As the Auditor noted, creating a system of systems (Diagnostic, Laboratory, Drug, Immunization) required yet another piece of software to link each of these disparate components together. As of late 2009, each of these systems could not communicate with each other, or with the Client Registry. The integrative piece of software, to be coupled with a portal (or viewer, to address the data presentation problem), is formally known as the "Health Information Access Layer", however it does not yet exist.³¹⁰

By treating the software issue as a decomposable problem, the government of Ontario created new challenges for themselves. After years of development, the government has a set of systems that cannot communicate with each other. Each system, to the extent that it is operational, functions independently. Moreover, each of these systems has their own unique standards and controls, making future integration exceedingly difficult.³¹¹ It is worth recalling that the primary objective of developing one EHR system was to ensure interoperability. Despite having this goal in mind, the provincial effort to create one EHR system has resulted in a number of central EHR systems that are not interoperable. As the Auditor notes in his report,

³¹⁰ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 34.

³¹¹ *Ibid.*, p. 24.

[the] EHR project is behind schedule and struggling to deliver on its mandate... integrating [these systems] so that they work together to collectively deliver an EHR to the medical community and all Ontarians remains a challenge.³¹²

The framework developed in chapter five suggests that the search for solutions to nondecomposable problems is best achieved with the insource-agency administration (IAA) form of governance. During the design phase of the EHR project, the government implicitly defined the software issue as a decomposable problem, and largely adopted an insource-Weberian administration (IWA) form of governance to search for solutions. By misdiagnosing the nature of the software problem, and applying the improper form of governance to find a solution(s), it can be concluded that the government established conditions that would inevitably lead to failure.

In the early 2000s, the government tasked the MOHLTC, a line department (hence an IWA type organization),³¹³ with the responsibility of developing a solution to the EHR software problem. Ostensibly dealing with a decomposable problem, the ministry approached the software issue from a number of different angles, and started developing a number of separate systems as solutions. To facilitate the solution search, the MOHLTC contracted a large number of consultants to work on these disparate systems. As the framework suggests, the hiring of short-term consultants is an inappropriate strategy to work on nondecomposable problems, because locating a solution to these types of problems necessitates a heuristic search strategy. Developing an effective search heuristic is not an immediate process, it requires time for individuals to learn, share and process information and knowledge. Therefore, while the Auditor was correct in noting that the MOHLTC

³¹² McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, p. 35.

³¹³ In chapter five, we identified traditional line departments, and hence the MOHLTC, as prototypical IWA type organizations.

was overly reliant on the use of short-term consultants, his conclusion is correct because locating an effective software solution was not predicated on the hiring temporary consultants. Rather, an effective solution would be found through the addition and retention of long-term core employees, who could develop an effective search heuristic for the software problem.

From 2002 to 2008, little progress was made on the central effort to locate a solution to the software problem. In 2004, the project was reorganized, and an Office of E-Health was created at the MOHLTC. In 2006, the process repeated itself, with another reorganization at the MOHLTC. Finally, in 2008, with no working software solution apparent, the government reorganized the project a third time, establishing a new crown agency, eHealth Ontario. Just one year later, eHealth Ontario went through its own reorganization.³¹⁴

The reorganization of the project in 2008 is particularly significant because the government chose to locate a solution to the software problem through an entirely different type of organization. While the MOHLTC is certainly an IWA type organization, we can infer that eHealth Ontario was designed to mimic an IAA type organization. First, eHealth Ontario was established as independent agency, like all IAA type organizations. Second, senior decision makers at eHealth Ontario believed they had the implied authority to hire individuals with specialized knowledge sets to quickly locate a solution. eHealth Ontario refrained from hiring ministry or SSHA staff, which they believed did not possess the requisite knowledge for the project. In effect, it appears that eHealth Ontario was attempting to develop a new team, with specialized knowledge sets, capable of locating an EHR software solution.³¹⁵ Third, unlike the MOHLTC, eHealth Ontario was exempt from traditional procurement policies and wage/benefit restrictions.³¹⁶ Like a prototypical IAA type organization, eHealth Ontario established unique, or atypical, remuneration system for its

³¹⁴ McCarter, *Special Report: Ontario's Electronic Health Records Initiative*, pp. 1-48.

³¹⁵ *Ibid.*, pp. 11, 12.

³¹⁶ *Ibid.*, p. 12.

employees. While it is unclear whether the government was purposefully creating an IAA type organization to search for a solution to the software problem, all of the critical elements were present in eHealth Ontario. Unfortunately, as demonstrated in chapter three, eHealth Ontario was beset by multiple scandals, and failed to deliver on its promise.

The choice of governance forms to address the EHR software problem, coupled with the multiple reorganizations, increased the likelihood of the three knowledge hazards manifesting themselves during the project. From 2002-2008, when the IWA form of governance was employed, it is reasonable to infer that the extensive use of outside consultants on short-term contracts led these agents to both appropriate and accumulate knowledge. It is also reasonable to infer that the use of consultants, and the multiple project reorganizations, led to some embedded knowledge destruction. Moreover, to the extent that a group search heuristic ever started to emerge at the MOHLTC, it would likely have been destroyed by the high turnover rate. After the eHealth Ontario agency was established in 2008, it is more difficult to judge whether the knowledge appropriation and accumulation manifested themselves. Simply put, the organization went through a complete reorganization after only twelve months, and it is unclear what progress was truly made. However, we can be relatively certain that the knowledge destruction hazard did emerge, simply by virtue of the number of actors that exited the agency.

In summary, we can infer that the government misdiagnosed the nature of the software, and adopted a poorly suited organizational form to search for a solution, that helped contribute to policy fiasco. With the benefit of hindsight, the software problem should have been approached differently during the design phase. A coherent strategic plan would have suggested that the government begin the search for a software solution with an IAA type organization –i.e. something akin to eHealth Ontario. This organization would have been given sufficient time and resources to develop a software tool capable of translating all the format/codes into a universal format, thus facilitating a central, interoperable, EHR system for the province. While

we can only speculate, it is certainly possible that senior decision makers in government came to the realization that an IAA type organization would best facilitate the development of a solution to the software problem. If this was the case, they were simply eight years too late.

SUMMARY OF THE DESIGN PHASE ANALYSIS – THE CRITICAL ERRORS

The analysis of the design phase of the EHR project suggests the government of Ontario made three critical and related errors:

(1) While government correctly diagnosed the network problem as decomposable, it adopted an inappropriate form of governance. By establishing a new agency, the SSHA, to coordinate the contracting, the government duplicated bureaucratic structures already present at the MOHLTC, which ultimately led to a higher cost solution. Moreover, establishing the SSHA, and allowing it to expand into the area of facilitating local EHR system integration, ensured that another unnecessary player was involved in the overall governance of the project.

(2) The government misdiagnosed the nature of the software problem as being decomposable, and largely adopted an inappropriate form of governance (IWA) to locate a solution. The failure to correctly diagnose the problem ensured that search costs would be high, and that valuable solutions were unlikely to be discovered.

(3) Reorganizing (four times) the search for solutions to the software problem, combined with a heavy reliance on outside consultants, ensured

that all three knowledge hazards would be present, further increasing costs.³¹⁷

Each of these critical errors helped contribute to project failure. The evidence clearly suggests that the government simply paid insufficient attention to the design phase of the project.

SPECULATING ON THE DECENTRALIZED APPROACH

Given our analysis of the EHR project, one point has become obvious: the decision to design a central system was logically inconsistent with the independent implementation approach adopted by the province. Why then did government adopt a decentralized approach in the first place?

While we can only engaged in informed speculation, one possibility is that the government simply failed to consider the implementation phase of the project, and whether EHR solutions are independent or interdependent. In this case, the government simply fashioned its strategy in accordance with the decentralized nature of the healthcare system. The second possibility is that government misdiagnosed EHR solutions as independent, as opposed to interdependent. In this case, adopting the decentralized approach was a conscious choice. Hence, government believed that decentralization would ultimately deliver the best possible EHR solution. The third and final possibility is that elements within the government correctly diagnosed EHR solutions as interdependent, but failed to effectively transmit this knowledge. The government therefore adopted a dual tract approach, simultaneously encouraging a centralized and decentralized EHR solution. The evidence suggests that the third scenario is most likely. The government ostensibly saw value in creating one interoperable EHR solution for the

³¹⁷ While reorganizing the project was likely a symptom of a lack of progress towards a solution, it nonetheless ensured that the knowledge destruction hazard would manifest itself.

province, given the activities undertaken by the SSHA and the MOHLTC to develop a central system. However, the MOHLTC (as well as Infoway) also funded independent healthcare organizations to develop their own unique solutions. This decision is curious, of course, because the MOHLTC and the SSHA simultaneously established formal bodies to ensure that these independent systems would somehow become interoperable in the future. Given the three possibilities highlighted above, the only thing we can say with certainty is that the government completely failed to coordinate internally. That failure, more than any other, ultimately led the project towards fiasco.

SUMMARY – A COHERENT STRATEGIC PLAN

It is apparent that Ontario's EHR project failed on a number of levels. With the benefit of hindsight, it is clear that a coherent strategic plan should have considered the implementation phase of the project first. Step one should have been an ironclad directive by political decision makers to develop one central EHR system. Moreover, through either the use of incentives or rules, decision makers should have actively discouraged the development and adoption of independent EHR and EMR solutions across the province. Turning our attention to the design phase of the project, the second step of a coherent plan should have defined the nature of the network and the software problems. Once defined, the government should have applied an appropriate governance structure to search for solutions. The framework suggests that the network problem would have been well served by an OM type approach, while the software problem would be well served by an IAA type approach. By considering both the design and the implementation phases of the EHR project, the government of Ontario could have significantly improved the likelihood of developing an effective EHR system for the province.

CONCLUSION

In 2010, the government recommitted itself to developing a central EHR system that would connect all Ontarians by 2015.³¹⁸ In many ways, the problems of governance and technology choice have come full circle. Once again, the province is at a crossroad. Assuming the central effort is successful, the province will have to decide whether to implement a rip-and-replace strategy, or continue operating in an uncoordinated manner. In 2015, the province will face the same choices it faced in 2000. Fifteen years later, very little will have changed. We can only hope that decision makers consider the implications of their actions, and devise a solution that ultimately delivers on the promise of EHRs.

³¹⁸ *Ontario's Plan for Electronic Health Records is at Risk, Official Says*, pp. 253-254.

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Chapter Seven

CONCLUSION

In the preceding chapter, we applied the frameworks developed in chapters four and five to analyze the Ontario's EHR project. We concluded that the EHR initiative suffered from a number of interrelated problems, at both the design phase, and the implementation phase, of the project. In this concluding chapter, we briefly review the key components of this study, and add a few final thoughts to the analysis, while suggesting some potential research extensions. We then return to some of the themes raised earlier in the introduction of this study, and highlight a few key lessons that might help reduce the frequency of government ICT project failure.

SUMMARY AND FUTURE RESEARCH DIRECTIONS

Ontario's EHR project had two main phases. A design phase, in which the architecture of the system was determined, and an implementation phase, in which the operation of the system was carried out. Our study had two broad objectives: first, to develop a set of frameworks that could be used to understand the phases; and second, to use these frameworks to describe why Ontario's EHR initiative was

so unsuccessful. To this end, we introduced the ehealth topic in chapter two, and reviewed the EHR project story in chapter three. In chapters four and five, we developed two frameworks to help us theorize about technology projects in governments; chapter four focused on implementation considerations, and chapter five focused on design considerations. In chapter six, we applied these frameworks to analyze the EHR project.

The thesis begins with the observation that Ontario's EHR project was a fiasco. After ten years, and over a billion dollars expended, the government of Ontario failed to realize its central objective: a fully functional and interoperable EHR system for the province. The key question addressed in the thesis is why this failure occurred.

The analysis undertaken in chapter six certainly helps to shed light on this particular story of fiasco, and the critical problems facing the project. We concluded that decision makers failed to consider the interdependent nature of EHR solutions. Moreover, decision makers encouraged independent actors to develop their ehealth solutions, effectively undermining the provincial goal of an interoperable system. We also concluded that decision makers misdiagnosed the nature of the EHR software problem, resulting in an ineffective search procedure to locate an EHR software solution. These two errors resulted in a policy fiasco that was manifested in almost total project failure. However, what is missing from this analysis is the "why". Why did decision makers define the software problem as decomposable? Why did decision makers adopt a decentralized approach? What led decision makers to conclude that EHR systems might be independent solutions?

In chapter six, we briefly speculated on a few of the "why" questions. However, more research and analysis is clearly called for. In the opinion of this author, there are a number of intriguing lines of inquiry that could be explored. Perhaps the most promising involves the application of insights from behavioral economics and psychology to explain the behavior and actions of senior decision makers during the course of the project. Increasing attention has been paid to human behavior in the

literature on project management, focusing on issues of strategic misrepresentation, overconfidence, anchoring, cognitive dissonance, and application of prospect theory to the problem of sunk costs. While this applied research is still in its infancy, it shows considerable promise to help answer the “why” questions previously identified.

GOVERNMENT ICT PROJECTS AND PUBLIC POLICY

In the introduction of this thesis, we noted that government ICT projects are notorious for succumbing to policy failure. The general public has become rightly concerned that government can simply not get these projects right. Over the course of this study, it has become apparent that much of literature on ICT projects (and in particular, on ehealth projects) is focused small, nuts and bolts, issues. By way of example, in chapter two we identified the key criteria cited in the literature for successful ehealth system implementation; these criteria included ‘providing targeted training to relevant users’, and ‘allowing users space for technology feedback and improvement.’³¹⁹ While these issues are undoubtedly important at some level, it is highly unlikely that an ehealth projects’ ultimate success rests on these types of criteria. Put another way, much of the literature is failing to see the forest for the trees.

If the problems apparent in Ontario’s EHR project are similar to those experienced in other government ICT projects, then the following interrelated recommendations may be useful:

(1) When considering a strategic plan for an ICT project, it is useful for decision makers to employ backwards induction (or back solving). The process of back solving for a solution often reveals challenges that are not readily apparent when traditional linear problem solving technique are employed. By reasoning backwards

³¹⁹ For more, refer back to chapter 2, page 26.

from a solution, decision makers can likely ascertain how particular forms of implementation affect design issues (certain design problems might be eliminated by an implementation choice, while other design problem might be exacerbated). Hence, by thinking about the 'implementation phase' of a project first, decision makers can make appropriate and informed decisions during 'design phase'.

(2) It is critical for decision makers to consider whether their ICT solutions are independent or interdependent. When solutions are interdependent, it is appropriate for government to exert its authority to facilitate cooperation and coordination; absent government intervention, it is likely that ICT projects will fail to deliver on their promise.

(3) Attention must be given to the nature of the ICT problem, and whether it is decomposable, nondecomposable or nearly decomposable. Different types of problems require different search strategies, and organizational forms, to effectively discover solutions. By implication, governments must not be wedded to one form, or style, of governance without first considering the nature of the ICT problem they are facing.

These three points are purposefully broad. They are designed to get theorists and practitioners thinking about the building blocks of any successful ICT project. All too frequently in government, ostensibly good ideas, like the development of an EHR system, turn bad. Decision makers get enamored with an idea, become engrossed in the details, and fail to consider implications of their actions. By encouraging decision makers to look at the big picture, we can take one step towards ensuring project viability, and one step away from ultimate project failure.