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Abstract Many current public sector challenges are characterized by layers of complexity; to address them, no single discipline or approach would be sufficient. Systemic design -the marriage of systems thinking and design thinking- has been identified as one promising avenue for tackling complexity. In the case of complex societal issues where human behaviour is at the core, we propose leveraging behavioural science within a systemic design framework. This paper outlines a case study of a systemic design project undertaken by Employment and Social Development Canada on an education savings incentive called the Canada Learning Bond. The project explored decision-making and perceptions of education, savings, and finances among families living on low incomes, and it demonstrates the practical application and value of systemic design and behavioural science in a public sector context.

Keywords: education, public policy, behavioural science, design thinking, systemic design

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[1] Opinions expressed are those of the authors.

1. Introduction

Many public sector challenges are characterized by complex, intertwined sets of problems. With their emergent elements and high degrees of unpredictability (Buchanan, 1992; Glouberman & Zimmerman, 2002; Snyder, 2013), such problems cannot be simply addressed using conventional models and analytical techniques (Duit Galaz, Eckerberg, & Ebbesson, 2010). No single discipline, methodology, or problem-solving framework would be sufficient to address them (Jones, 2017; Snyder, 2013). To tackle such complex challenges, governments need to go beyond conventional methods; public servants need to be better equipped with innovative, adaptive tools and techniques that foster active collaborations to offer more holistic, systemic approaches to problem-solving. In light of this need, we see the emergence of public sector innovation labs that bring together multidisciplinary teams to experiment with new approaches to problem-solving. In the Government of Canada, the Innovation Lab in Employment and Social Development Canada (ESDC) was established to engage with Canadians, stakeholders, and internal clients to gather new insights and fuel collaborative conversations to develop and experiment with new approaches that are responsive to the needs of Canadians.

This paper outlines a case study of a project undertaken by ESDC on an education savings incentive called the Canada Learning Bond (CLB). The project explored decision-making and perceptions of education, savings, and finances among families living on low incomes. To tackle the complex nature of these issues, the project incorporated a range of methods from systemic design and behavioural science, and also drew upon theory of change, an approach from program evaluation. This unique combination of methods creates a compelling case study in public sector design. In reflecting on this experience, we would highlight learning around the mixed-methods research approach, the interactions of these methods, and how this impacted the process and insights gained during the project. In the next sections, we first provide an overview of systemic design and behavioural science - two research approaches that have recently been co-located within the Lab at ESDC with the expressed intent to integrate these methodologies - and then we present the case study on the CLB.

1.1. Systemic Design

A marriage of systems thinking and design thinking, systemic design has been identified as one way to tackle complex policy challenges (Conway, Master, & Therold, 2017; Jones, 2017). Systems thinking seeks to understand the complexity of cause and effect dynamics by visualizing how these dynamics are part of a larger inter-connected system. By broadening the boundaries and surfacing deeper problems, systems thinking can identify new and strategic opportunities in a problem space and lead to a better understanding of side-effects and unintended consequences of a given intervention (Senge, Smith, Kruschwitz, Laur, Schley, 2008).

Design thinking is an exploratory problem-solving approach with a bias for action (Camacho, 2016). The Lab has built on the classic double diamond approach developed by the Design Council (2013).

Like many labs, ESDC's approach (see Figure 1) places an emphasis on exploration to identify the right problem, idea generation, and iterative prototyping and testing of ideas to land on the right solution. Design thinking derives its inspiration from the experience of the "end-user", the person who will ultimately use a service or product – an approach that can stand in contrast to traditional expert-driven policy-making (Design Council, 2013). Design thinking prioritizes putting concrete prototypes into the world, which are tested with end-users to ensure that the proposed solution has traction on the ground. This approach is intended to enable new ideas to be tested in an incremental iterative fashion to gather data on uncertainties of the proposed solutions before committing to the costs of a large-scale roll out.
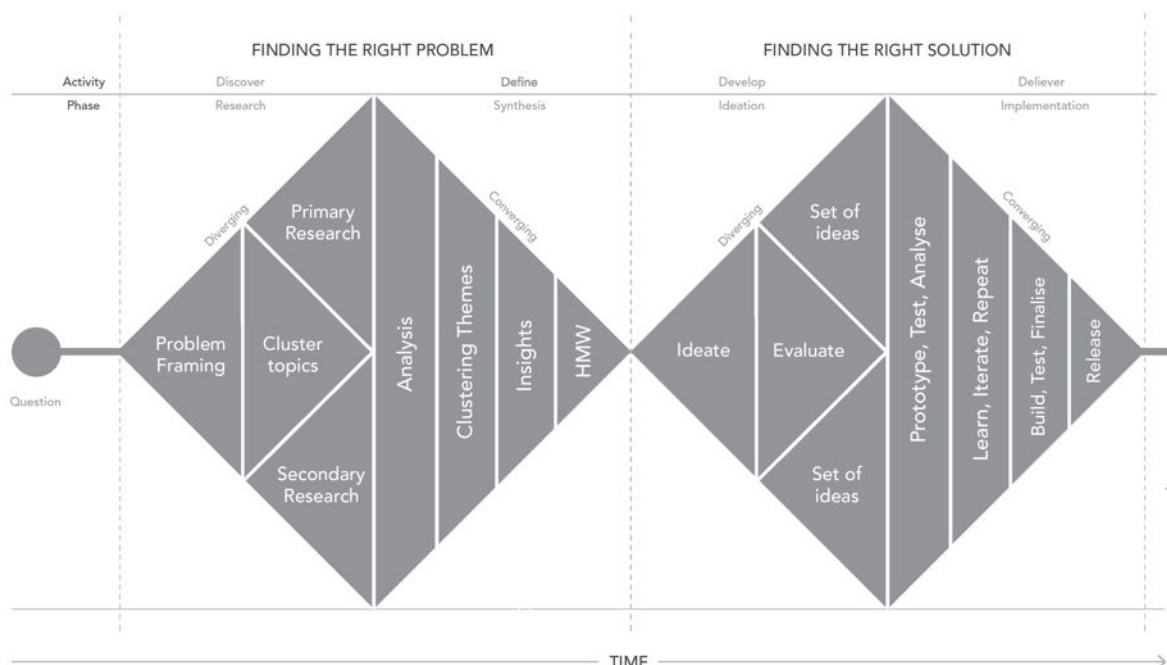

Figure 1. ESDC Lab's design thinking process.

Both design thinking and systems thinking share a commitment to leverage the knowledge and perspective of diverse actors to better understand what is happening on the ground to identify opportunities that will work. By bringing together the holistic approach of systems thinking with design thinking and its bias to testing and iteration, systemic design seeks to develop more robust solutions at the right scale (Jones, 2014).

1.2. The Value of Integrating Behavioural Science with Systemic Design

Over the past few decades, social and behavioural sciences, such as psychology, cognitive science, and behavioural economics have substantially advanced our understanding of human behaviour and decision-making. Insights emerging from these areas offer a significant opportunity for policy makers to understand people's actual experiences and behaviours in relation to policies, programs, and

services. Research in these areas does not just describe the 'what' of human behaviour, but has continually advanced its techniques to explore the 'why' underlying those behavioural patterns and to gain a thorough understanding of the cultural and situational factors that influence behaviour. There has been growing interest in applying behavioural science to address policy challenges (Sanders, Snijders, & Hallsworth, 2018; Whitehead, Jones, Howell, Lilley, & Pykett, 2014). But to date, most of its applications to public policy have been limited in scope, focusing on individual behaviours. Indeed, this has been one of the major critiques of the field (Sanders et al., 2018). However, the potential for applying behavioural sciences within more holistic frameworks to address more complex policy challenges has been recognized as a necessary and valuable avenue for the field moving forward (Sanders et al., 2018).

As acknowledged earlier, no single discipline offers a silver bullet to address complex problems. Thus, relying on existing theoretical models and methods in behavioural sciences *alone* would not be sufficient for addressing complex problems (Duit et al., 2010; Spencer, 2018); however, leveraging existing knowledge and methods from behavioural science within a systemic design framework offers a unique opportunity for tackling complex problems where human behaviour plays a substantial role. When applying systems thinking to issues involving the natural environment, this work tends to be informed by our knowledge of the natural sciences. Likewise, when applying systems thinking to wicked societal problems in which human behaviour is at the core, knowledge from behavioural science can be leveraged to ensure that the models we develop reflect a realistic view of how people think, feel, and behave in given situational contexts. This requires active interdisciplinary collaborations, built on in-depth understanding, rather than mere borrowing (Dorst, 2017). In the next section, we present ESDC's case study on the CLB, demonstrating the value of collaborations leveraging systemic design and behavioural science together in a public sector context.

2. Case Study: The Canada Learning Bond Project at Employment and Social Development Canada

The CLB project is a systemic design project that was born out of behavioural science trials. The integration of behavioural science and systemic design continued to characterize this project as it unfolded, highlighting the complementarity of these two disciplines in driving public sector change from within.

The Government of Canada encourages the use of Registered Education Savings Plans (RESP) to save for the post-secondary education of a child. This includes the CLB, an income-tested education savings incentive available for eligible children from families living with lower incomes (ESDC, 2015; Parkin, 2016). When a parent goes to an RESP promoter and opens an RESP for their eligible child, the government will deposit money in the account towards the child's post-secondary education. It provides an initial payment of $500 into the RESP plus an additional $100 for each year of eligibility to a maximum $2,000. No personal contributions are required to receive the CLB. As of 2017 take-up

was 36.5%, with 1.9 million children that have yet to receive it. The Government of Canada also offers another incentive for those who save money in RESPs called the Canada Education Savings Grant. Unlike the CLB, this incentive is available to eligible children who have RESPs regardless of their family income, but it is conditional upon money being saved in the RESP. Subscribers face many decisions: the RESP promoter, the RESP product, and investment options.

As an initial attempt to address low take-up of the CLB, the program turned to behavioural science trials. Different variants of the letter sent to eligible families were designed based on general insights from behavioural science literature, and the effectiveness of each of these letters was assessed in a series of randomized controlled trials (ESDC, 2017)[2]. The results indicated that sending letters to parents of eligible children resulted in a statistically significant but modest increase in program take-up. Simple changes to the messaging around the CLB did not seem to have a large impact, and in some cases, some of the new messaging techniques seemed to reduce, rather than increase, program take-up.

While the problem initially appeared at the surface to be a simple one of awareness, taking this client-centred approach revealed its complexity and the need for a more holistic approach. With this recognition, the CLB systemic design project was launched, championing a way to better understand the lived experience of Canadians, which we outline in the next section.

2.1. Research Approach

Within ESDC, the Canada Education Savings Program (CESP) is responsible for delivering the CLB. In the CLB project, CESP and the ESDC Innovation Lab partnered on a journey to understand the needs of Canadians living with low income, to help increase the uptake of the CLB. As part of this, program employees were embedded within the Lab team, in order to have an organizational bridge to support the implementation of ideas.

In the CLB project, the team sought to better understand the dynamics underlying the results of the letter trials, with a focus on the broader context of education, decision-making, and savings in families living with low income, adopting a systems-level approach, which enabled us to explore the many individual-level and system-level factors that are entwined with parents' willingness and ability to save for their children's education.

At the early stages of research and problem identification, the team held conversations to develop a common understanding of what we think we know, including evidence from relevant behavioural science findings captured using discussion cards. A key outcome of these conversations was the identification of assumptions held within the organization and externally, and an analysis of weak

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[2] A randomized controlled trial is a research method used often in social/behavioural science to assess the causal impact of introducing variants of interventions (in this case, letter variations) on outcomes of interest (CLB uptake).

assumptions and strong assumptions. It is common when dealing with programs that tackle complex social issues for different actors to have different assumptions, and different narratives of how and why a program works (Weiss, 1995). Some people talked about the CLB as a benefit that should be easily accessible for everyone, reflecting the objective of equitable attainment of post-secondary education. Others spoke of it as a savings incentive or even talked about RESPs as an investment product, which reflects a perspective of the program as a savings incentive for those that are in a position to save.

By surfacing these narratives, and the assumptions embedded in them, the team was able to tease apart expectations and lines of reasoning. As part of this, the team conducted a theory of change analysis to make explicit the assumptions embedded within the design of the program itself (Weiss, 1995). Theory of change is typically an evaluation approach, and is often described as "a logic model on steroids" (Patton, McKegg, & Wehipeihana, p. 170). Logic models articulate how a program will have its intended outcome. Theory of change augments this by identifying the cause and effect hypotheses that implicitly lie between early efforts (inputs, activities, and outputs) and longer-term outcomes. The theory of change analysis included an examination of the evidence pertaining to the assumptions of causation in the program, and identifying contextual variables. The theory of change helped focus the inquiry by identifying which assumptions in the program design are well supported by existing literature and which could benefit from further exploration. It also directly informed the level of analysis of the systems map, by rooting the analysis in the ultimate outcomes of the program, which is the attainment of post-secondary education of the child, rather than, for instance, the opening of an RESP.

The problem exploration phase included the co-development of a systems map to ground the systems analysis. The team engaged key stakeholders to leverage system-wide knowledge and insights in a participatory systems mapping exercise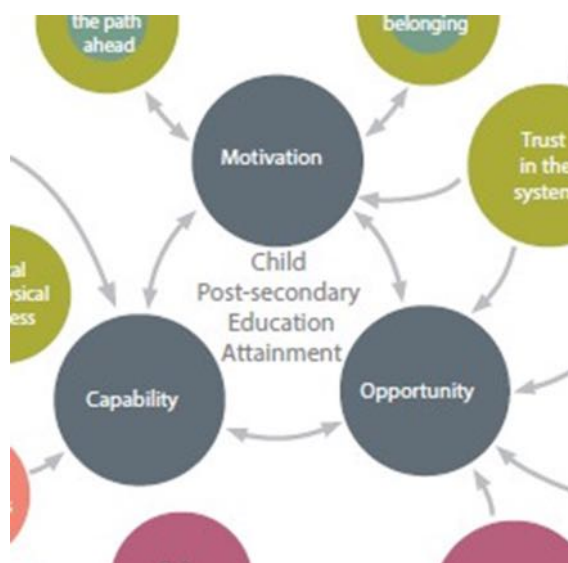 (for details on a similar approach, see Sedlacko, Martinuzzi, Røpke, Videira, & Antunes, 2014). Systems mapping enabled the team to ground the inquiry in a broad context by mapping the various factors that contribute to children's post-secondary education attainment. This expansion of the frame of inquiry enabled an exploration of root causes to better understand and consider factors and ideas that traverse program and jurisdictional boundaries, enabling us to identify ideas at this higher-level scale of problem-solving. The map centered on the child, around three essential conditions for post-secondary education attainment: motivation, capability, and opportunity (See Figure 2). These key conditions were identified based on a behavioural science framework called "The Behavioural Change

Figure 2. The systems map centered around three behavioural anchors: motivation, capability, and opportunity.

Wheel" (Michie, Atkins, & West, 2014) and they provided a coherent framework for the map, enabling us to identify leverage points that are directly tied to behavioural outcomes – but no easy answers. Putting the child at the centre kept us focused on the larger systemic issues. Leverage points identified through this process included friends and families, trust in the system, the affordability of education, the financial capability to save, seeing the path ahead, community support, parental life-long learning, informational needs, and financial literacy.

Developing the systems map was not easy, reflecting the complexity of the issue, which spans motivations of parents and children (and even earlier generations), phases of childhood development over the course of 18 years, and the evolution of family dynamics and economic status over that same period. These complexities were timely reminders of the need to be humble in the face of a difficult challenge.

Understanding the challenge required working closely with a broad variety of actors in the system, most importantly end-users: Canadian families living with low income. The team travelled to multiple locations across the country ensuring that a diversity of end-users was reflected. We met single mothers, underemployed parents, grandparents, as well as youth and children. We interviewed people where they felt most comfortable: sometimes in community centers and other public spaces, while others welcomed us into their own homes where we were able to have our conversations over dinner. We talked to Canadians living in rural, as well as urban, communities and visited First Nations. We also ran workshops with parents and youth using a gamified approach called Welcome to My World (Gray, Brown, & Macanufo, 2010) to facilitate conversations surrounding education, decision-making, and savings; and an adapted game of Chutes and Ladders to discuss barriers and enablers to educational attainment.

2.2. Insights

Exploring the program through systems mapping and fieldwork revealed useful design insights:

1. Awareness of the CLB is an issue.
Clients need to be better informed about what is available to them. Many of the parents that we spoke with were not aware of the CLB, but when it was explained to them, they wanted it for their children. A single channel (e.g., one or several letters sent to families) was not enough for most. Increasing awareness requires the use of diverse methods of outreach and touchpoints to reach parents, children, and potential influencers in the system, including community outreach and social media.

2. Promoting the CLB requires a multi-sectoral effort.
We spoke to a wide range of community organizations that see a need to support parents in their journey. They tend to promote the CLB as a benefit (vs. an education savings incentive). Many parents needed help with the sign-up process for an RESP from community organizations. We also spoke to potential influencers in the system such as social workers and teachers; most had never

heard of the CLB before.

3. It's complicated: the messaging, choices, and process can be overwhelming.
As people navigated through the journey to get the CLB, they encountered different layers of complexity: in the messaging, the choices presented to them, and the process of opening an RESP and requesting the CLB. Much of the complexity is associated with the requirements of the RESP mechanism, which requires clients to enter into a financial relationship with an RESP promoter.

4.   Parents need to feel safe when investing for their children.

The CLB's link to an investment vehicle affects the conditions that shape the decision-making context. It raises considerations about how people are informed and how the program design takes account of the distinct behavioural and psychological characteristics associated with living in low income. We heard about financial risk that ranged from losing money that was invested, to committing to locked-in, monthly contributions. Parental emotions can also factor into financial risks; parents often expressed that their calculations around education savings were connected to feelings of love and guilt, and these emotions can also create vulnerabilities when making financial decisions.

5. Aspiration is not enough. The systemic barriers to education are too hard for some families to overcome alone.
The systemic barriers to education are too hard for some families to overcome alone. The majority of the parents we spoke with were passionate about their children pursuing post-secondary education, even if the parents themselves had not found their own way to it. However, aspiration for higher education or a 'better' life is not enough. Many other conditions are needed -besides money- for educational attainment to be possible. Many challenges stand in the way including geography, disability, illness, academic achievement, the stigma of living in poverty, and experiences of racism.

6. People aren't finding their path in life. This is resulting in lost potential for themselves and Canadian society.
Some parents have not finished their own education and cannot see a future path for themselves, let alone for their children. The pressures of early pregnancy and child-rearing (for men and women) make it difficult for some to role-model educational attainment and career success within the family.

7. The needs of the present compete with the needs of the future.
Some low-income families are in survival mode, struggling to survive their present circumstances. With imminent short-term needs consuming their attention, it is incredibly difficult (mentally and physically) for them to plan or save for the distant future.

8. For some, avoiding the embarrassment of asking for help takes precedence over thinking about the future.
Topics such as finances, education, and career development/upskilling are closely intertwined with

identity and emotional wellbeing. Conversations around these topics can cause discomfort and vulnerability in many teens and parents. Those who are most vulnerable, experiencing mental health issues or addiction, may avoid asking community support services for help with navigating the system.

9. Foundational identification, which is required for accessing the CLB, is also necessary for full participation in society.
Access to ID is a significant barrier for some, particularly Indigenous Peoples. While the Federal Government does not require fees, at the provincial level there is a cost to applying for a birth certificate, which can make the difference in access for low income families. ID unlocks access to the CLB but also other life milestones, such as driving and employment.

Taken together, these nine insights helped uncover the problem spaces to focus on. The team identified three design criteria we used to evaluate ideas: increasing awareness, increasing ease of access, and increasing financial security. Additionally, we identified that the circumstances facing some Canadians make it challenging for them to even consider education and education savings. We asked ourselves: what else could we do for people in this situation?

The team developed a number of solutions that had been identified in the workshop process, some incremental and some transformative, and conducted some initial testing. Thus far, this has included concept testing with stakeholders as well as randomized controlled trials in regularly-scheduled letters testing new language and addressing areas of complexity and uncertainty that were identified in the qualitative research. Further testing and iteration is needed for more intricate ideas that have been developed to see whether they could trigger the desired changes in the system.

3.0   Discussion and Conclusions

This paper outlined the journey of the Innovation Lab, demonstrating how leveraging behavioural science within a systemic design framework can deepen our understanding of complex public sector challenges, and create opportunities for addressing them from within.

The use of mixed-methods provided a rudder to the inquiry – with findings from quantitative and qualitative research approaches mutually reinforcing each other and providing new directions for the study as it evolved. We did not follow a preset course, but rather responded to what we were hearing. The team continually experimented with ways to actively engage with insights from behavioural science along the way; an avenue that can still be further explored in future work. Having a diverse team with different disciplinary backgrounds immersed in the challenge was necessary to lay the ground for this agile use of mixed-methods.

Similarly, the theory of change analysis may not be typically used in systemic design, but integrating it added clarity and rigor to the analysis of assumptions and would be recommended for future

research as part of the systemic design toolkit. Both the theory of change and systems mapping approaches directly impacted the framing of the problem spaces, allowing for a deeper understanding of the problem and outlining the necessary and sufficient conditions for long-term change. The systems map highlighted this bigger picture narrative, while keeping the essential conditions for behavioural change in perspective as we explored options.

By integrating tools and methods from design thinking, systems thinking, and behavioural science, ESDC championed a holistic approach to understanding the needs of Canadians within the Government of Canada. Engaging with the lived experience of Canadians provides a breadth of learning that provides holistic insights that can support policy, program development, and service delivery. Senge and colleagues (2008) wisely note that successful collaboration is easier to espouse than achieve. This project continues to provide lessons on how to best engage partners across a vast country like Canada – "getting the system in the room" (Senge et al., 2008, p. 234), while ensuring respectful partnerships, humility, and open communication, without over-burdening communities. A sustainable and ethical innovation strategy has emerged from our work and continues to evolve.

The experience of leading a design-based innovation process from within the Government of Canada, in close collaboration with those directly responsible for program delivery, has yielded many lessons in driving change from within. The ability of systemic design to spark innovation and support meaningful change within government can be shaped by deliberate attention to active multidisciplinary collaboration, respectful negotiation, and mobilization of leadership. Importantly, systemic design is ideally suited for identifying opportunities that cut across traditional organizational boundaries. Successful implementation of such ideas requires collaboration and an expansive search for champions. In doing so, we see change. It is fostering a cultural change in our organization and has sparked conversation across government on how we understand our clients, their needs, and the prioritization of sustainable policy frameworks.

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