

Assessing and optimizing research and innovation impact: developing and implementing a holistic systems approach

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Abstract

Increasing demand to demonstrate the societal impact of research and innovation investments comes not only from government and funders for accountability purposes, but also private industry and others, who want to use impact evaluation to inform ways of increasing benefits, and improve their return on investment. Citizens also wish to see an increase in benefits to their region. Impact assessments should also further the understanding of “what works or does not work, under what conditions for whom”. In Alberta, Canada, we developed a “fit for purpose” performance and impact management system that aims to assess impact and optimize returns for decision makers while engaging users. This paper describes the Alberta team’s work that evolved from applying an evidence-based practice framework for evaluating research impact. Drawing on various theories, methodological developments resulted from testing models and approaches across sectors for generating practice-based evidence. The paper outlines the evolution across six phases that contribute to the international literature, and highlights the development of applications, resulting in new learnings and reflections with each iteration. Key learnings are that designing for impact upfront, and continuously monitoring and evaluating impact are effective tools to inform adjustments along implementation pathways to enhance impact. Transitioning to a holistic systems approach that values quantitative and qualitative methods, and combines evidence from impact management systems is necessary for assessing challenge type initiatives. A promising practice is conducting complementary deep-dive realist impact assessment case studies to help understand “how” and “why” the impact occurred and who benefited.

Keywords holistic systems, impact assessment, impact management, innovation, payback, performance monitoring

Introduction

For many years the evaluation of Research and Innovation (R&I) has been evolving with increasing emphasis on assessing the wider impacts for the purpose of accountability and using evaluations to provide lessons on how to generate and optimize impact. These approaches typically include an impact framework that defines the multiple impact dimensions and the process of generating R&I impact (UKRI 2024). This paper focuses on using research impact assessment to optimize such impact. The article aims to share lessons learned from using evidence-based practice frameworks and generating practice-based evidence that evolved across six phases and sometimes in a concurrent fashion. The aim of this evolutionary work in Alberta, Canada, of developing approaches to assess R&I initiatives, and implementing them in the real world across different organizations, sectors and jurisdictions, was to gain an understanding of how to generate and scale for greater impact over time.

We start by placing this long body of work in the context of the initial development of the Payback Framework in the UK (Buxton and Hanney 1996; Donovan and Hanney 2011). This framework is often seen as the most widely applied of many frameworks for assessing the impact of health research (Penfield et al. 2014; Greenhalgh et al. 2016). It informed the initial work in Alberta. The Payback Framework consists

of a multidimensional categorization of benefits (or impacts, using a broad definition for the term) and a logic model to help organize the assessment of payback. In addition to traditional academic impacts such as publications, and societal impacts such as improving healthcare, the concept of absorptive capacity suggested that research active clinicians were more likely to understand and use research findings wherever they came from. When Martin Buxton and Steve Hanney, at Brunel University of London’s Health Economics Research Group, first presented the pioneering Payback Framework for assessing the wider impact from health research in 1996, they proposed several reasons for undertaking such evaluations. These included not only providing accountability by estimating the level of payback of completed research but also goals such as “*prospectively identifying how and where payback could be expected to occur from a proposed project in order to help maximize the payback.*” (Buxton and Hanney 1996, p.41). A new analysis suggests, however, that until the recent pioneering work of the Novo Nordisk Foundation, a major Danish philanthropic research funder, there had, in practice, been few sustained attempts to prospectively identify the impact that might arise from a proposed health research study, and manage the research to achieve such impact (Balling et al. 2025).

Nevertheless, even though the full prospective assessment has generally been too challenging to adopt, practical applications of the Payback Framework, including in fields beyond health (Klautzer et al. 2011), have increasingly gone beyond just demonstrating the wider retrospective impacts made by the research. In line with a less ambitious version of the goal, i.e. to use assessments to enhance impacts from future (not current) proposals, these evaluations have analyzed how the impact was achieved—with the aim of “*identifying opportunities for development*” (Wooding et al. 2005, p.1145), and aimed to identify “*what factors seem to be associated with ... research making an impact*” (Hanney et al. 2007, p.ix). Commenting on applications of the Payback Framework, a senior official involved in UK public funding of health research, emphasized how originally it had been developed collaboratively with officials in the Department of Health’s R&D Division and: “*studies have applied the framework to provide funders and policy-makers with evidence that will help them optimize the outcomes from their funding.*” (Henshall 2011, p.258).

The Payback Framework’s logic model for organizing the assessment of impacts has played a key role in enabling applications of the Framework to assess impact and also analyze factors linked to achieving the impact, and possible ways of boosting the payback from future research. The model takes a systems approach and positions the three specific research stages—inputs, processes and (primary) outputs—within the wider health, social and economic systems and the general stock of knowledge. The model was refined in successive studies (Buxton et al. 2000; Hanney et al. 2003 and 2004) ending with the version from 2004 presented in Fig. 1.

In creating the Payback Framework model Buxton and Hanney drew heavily on earlier research in the UK by Maurice Kogan and Mary Henkel (Kogan and Henkel 1983; Kogan et al. 2006). This highlighted the importance of

collaboration between researchers and potential users in setting priorities. The model of the Payback Framework was therefore constructed in a way that made it more than a basic logic model because it was informed by theories developed by Kogan and Henkel, on their research of the salience of an interactive approach. Thus, the model encouraged analysis of how far collaboration or interaction, now increasingly called engaged research (Bednarek et al. 2025), was in place, and its role in helping to generate impact. Such analysis of interactions was further facilitated by the incorporation into the model of Kogan and Henkel’s suggestion that at the interfaces between the wider system and research system, it is important to take a holistic or a whole-system approach and analyze the degree of permeability and brokerage roles (Buxton and Hanney 1996). Therefore, taking a whole systems approach, both increases the chances of achieving impact because it brings together researchers and users of research to interactively fulfil various functions of a health research system (e.g. prioritization, implementation), and assists the identification of the impacts achieved by focusing assessment on the full range of relevant factors. Furthermore, this has been formalised to the extent that the evaluation of impact is promoted as a crucial component of a health research system, with the Payback Framework helping to inform the development of the World Health Organization (WHO)’s framework for such systems (Pang et al. 2003). Then, that framework, in turn, is used in attempts to analyze and boost the achievements of health research systems (Hanney et al. 2020; Hanney and Yazdizadeh 2025).

The series of steps described in this article taken by senior health research leaders in Canada, led by experts from the province of Alberta, started from an application of the Payback Framework, and developed an approach for generating real world impact. The approach went beyond the

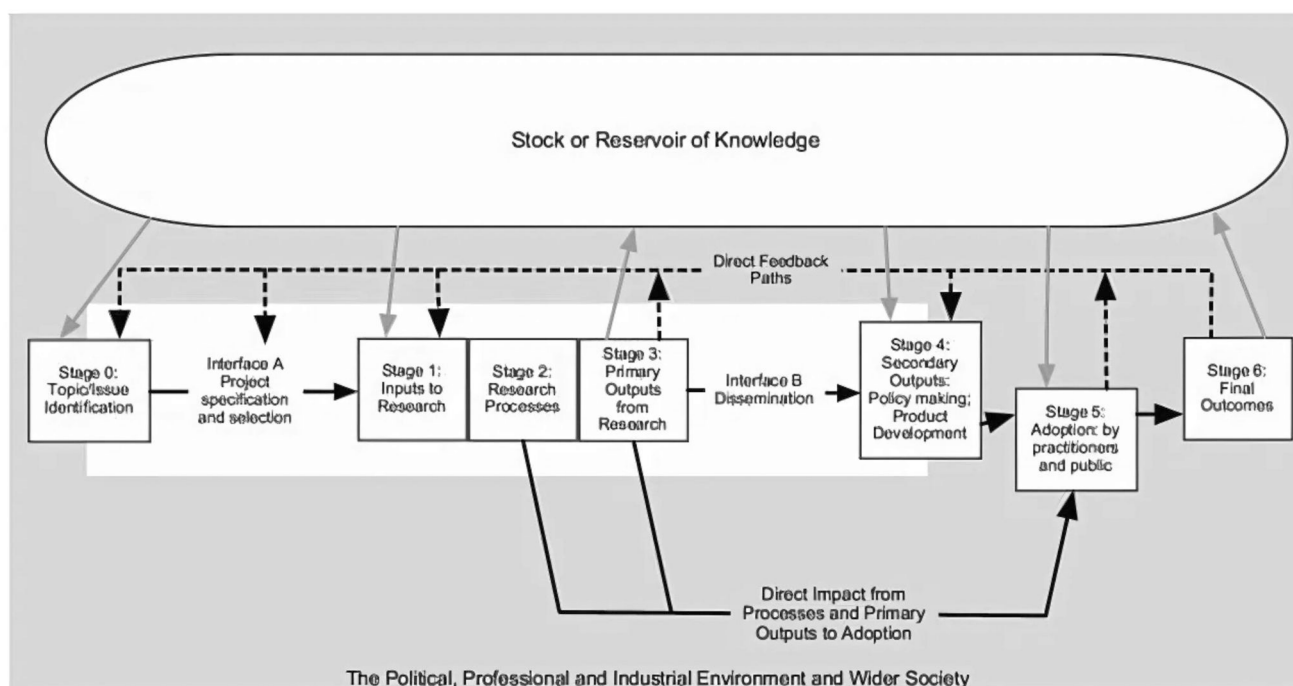


Figure 1 Refined version of the Payback Framework’s model for organizing the assessment of the impacts from health research.

Source: Hanney et al. 2004 (Adapted from previous versions of the Buxton/Hanney model for assessing the payback from health research—Buxton and Hanney 1996; Buxton et al. 2000; Hanney et al. 2003)

health sector to environmental and entrepreneurial R&I to generate and scale for greater impact. This process is described as six phases of methodological development and/or practical applications. The developments occurred in the context of the main public research funder in Alberta wishing to demonstrate the impacts of the research for accountability reasons and, using analysis of the impact achieved, identify ways to optimize future impact by design.

In addition to describing the six phases, this article reflects on the team's increasing recognition that their "fit for purpose" response to the developing context reflected impact and adaptive management approaches from the literature. Therefore, the Discussion elaborates relevant aspects of the large body of literature on learning and adaptive management systems. This includes topics such as having a culture of continuous monitoring and evaluation, creating feedback loop structures, encouraging a learning culture and knowledge sharing across the organization, and putting in place an adaptive strategy development (Holton and Baldwin 2007; Jick and Peiperl 2010; Allen and Gunderson 2011; Ramalingam 2013; Christensen 2015; Hill 2015; Mergel et al. 2018).

Relevant literature on the learning journey, reflexivity, and adaptability includes one account that advocated: "*simultaneous experiments, process reflection, and double loop learning—not simply adding facts into identified gaps but rethinking models and assumptions*" (Rogers and Macfarlan 2020, p.4). Much of the work of the Alberta team mirrored this approach, and the timeline and evolution of actions across the six phases of the learning journey is outlined in Appendix 1.

Phase 1: The development of a health research impact assessment framework for Canada—from the UK payback framework to the Canadian academy of health sciences framework

Cy Frank, a leading medical academic from Alberta, was invited to chair the expert international panel formed by the Canadian Academy of Health Sciences (CAHS) to identify a preferred framework and indicators for assessing the impact of health research. Some of Frank's research had been the subject of an impact case study when Buxton conducted the Brunel team's first international application of the Payback Framework in Canada by working with local researchers to apply it to examples of research funded by the Alberta Heritage Foundation for Medical Research (Buxton and Schneider 1999). The CAHS panel recommended adopting a Canadian health research impact framework informed by the Payback Framework. (CAHS Panel on Return on Investment in Health Research 2009; Frank and Nason 2009). The report provided a rationale for this, including that the Payback Framework "*has been adopted by CIHR [Canadian Institutes of Health Research] and a number of other international research funders, and because it provides an opportunity for a multidimensional approach to research evaluation*" (CAHS 2009, p.57).

The Payback Framework's original multidimensional categorization of impacts was broadly retained, but the panel revised the model to fit the Canadian health context. The panel's emphasis on consensus building involved refinement of the framework through consultation and endorsement by 23 interestholder organizations across Canada. The CAHS's framework included health determinants as part of the context in which research takes place and adopts a systems approach to tracking and measuring the five categories of

impact. It also integrates CIHRs four pillars of health research, including health services and policy research. The CAHS payback model is shown in Fig. 2 (CAHS 2009).

The report provided a toolbox for evaluating health research including the comprehensive set of impact categories and definitions, in addition to a library of different indicators and metrics. It had a starting menu of 66 preferred indicators to facilitate applicability to the wide range of types of health research and levels of impact from individual through to national and international. The report's summary concluded by describing the need to go beyond the important work of evaluating health research impact. By drawing on the recommended framework it suggested, "*A systems approach to tracking knowledge flows, barriers and facilitating factors that influence outputs and outcomes can be defined over time. Learning will help guide better health research investment decisions in the future.*" (CAHS 2009, p.36).

The CAHS framework was soon applied or used in assessments of the impact of examples of health research, including by the Canadian Cancer Research Institute (Montague and Valentim 2010) and the Catalan Agency for Health Information, Assessment and Quality (Adam et al. 2012). The report from a 2015 forum about applications in practice of the CAHS framework described the background to its creation and further examples of its use, including in successive strategy documents from CIHR (Alberta Innovates—Health Solutions [AIHS] and the National Alliance of Provincial Health Research Organizations [NAPHRO] 2015). More recently, it has been adopted by the Association of Australian Medical Research Institutes in Australia (AAMRI 2021).

Phase 2: Developing and implementing a "fit for purpose" health research impact framework—application and adaptation of CAHS to a provincial health research funding organization

Kathryn Graham and her team applied the CAHS framework to assess the impact of one of the funded programs by the Alberta Heritage Foundation for Medical Research (AHFMR). In 2010 AHFMR was transformed into Alberta Innovates—Health Solutions (AIHS), one of four Alberta Innovates organizations that were created to catalyze R&I within the province. Decision makers at AIHS wanted to develop an evaluation framework "*that could be systematically applied to assess organizational and program impacts.*" (Graham et al. 2012, p.355). Graham and colleagues reported that while the CAHS framework's impact categories enabled them to analyze and present the program's impacts, additional indicators were needed to assess the routine performance of AIHS, sometimes referred as "organizational impact", as well as highlight the importance of reach as a key strategy for progressing to impact (Graham et al. 2012).

Therefore, as part of its mandate "*to improve health, the health system, and socioeconomic well-being of Albertans through health research and innovation*" (Graham et al. 2012, p.354), the team aimed to not only measure impact but also aimed to optimize it by developing and implementing a "fit for purpose" framework based on CAHS. To do this, the AIHS team co-developed a revised framework, explicitly called an "Impact Framework". AIHS used this as a guide to inform the selection of progress indicators, including the organization's inputs and activities such as how

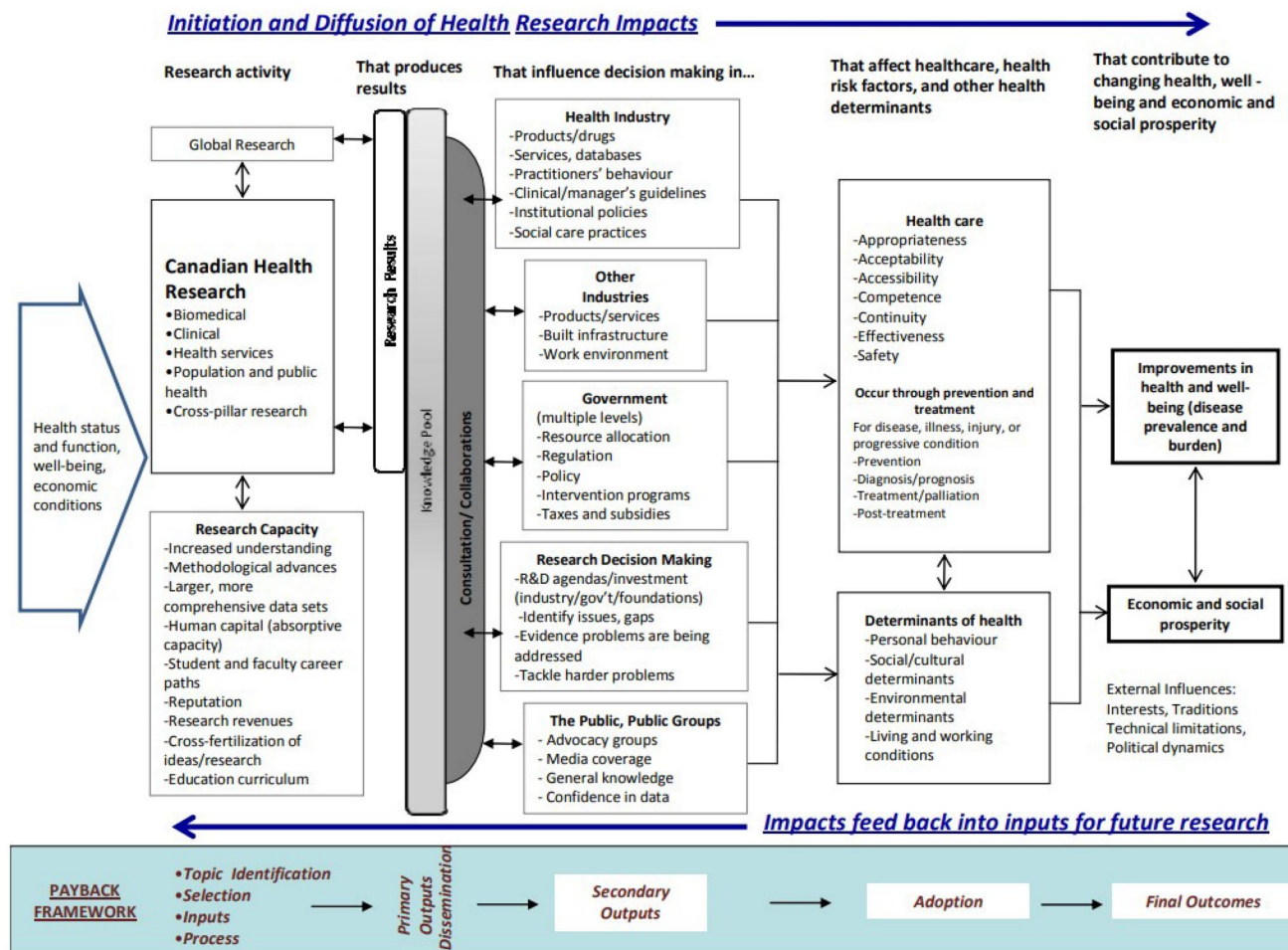


Figure 2 CAHS model for assessing health research impacts.

Source: Adapted from CAHS 2009 (see also Graham et al. 2012)

interestholder engagement intended to contribute to system-level outcomes. AIHS consequently developed a set of data collection and reporting tools for integrated performance monitoring and evaluation that tracked progress to impact.

Graham and colleagues continued to develop the impact framework as well as a set of accompanying tools: “Using an experiential, learning approach, the organization developed, implemented, and revised an organizational conceptual R&I framework that serves as the foundation of its impact assessment activities.” (Graham et al. 2018, p.2). The second enhancement reflected the process of generating impact as more circular with double feedback loops rather than the previous linear depiction. The aim was to better illustrate the system complexities and dynamic nature of R&I necessary for informing decisions and actions. This is presented as Fig. 3 (Graham et al. 2018).

Figure 3 reads from left to right, with research activity informing decision-making for implementing innovations, which should eventually result in changes in health and economic prosperity. Once again, there was feedback from the research to create inputs for current and future research (Graham, et al. 2018). For optimization of impact “the model proposed that engagement starts early with the identification of needs and opportunities.” (Graham et al. 2018, p.6). In operationalizing the framework, emphasis was given to using new reporting tools such as Dimensions (2024) for classifying

research investment priorities at the start of the funding life cycle, and at the end, using Researchfish® a tool that routinely gathers data on the impacts of investments to meet organizational needs including performance monitoring (Graham et al. 2018).

In 2016, Alberta Innovates consolidated four individual sector-focused agencies including AIHS, into one cross-sectoral research and innovation agency. Additionally, Graham and her team continued to evolve the work on assessing and optimizing impact across all sectors including, environment and entrepreneurship (Alberta Innovates 2024a). The development and continued adaptation of the Alberta Innovates R&I Impact Framework is described below in Phases 4–6. In Phase 3 we explore how the Alberta R&I system, including the impact assessment team, worked with the health system on an initiative to scale R&I in Alberta.

Phase 3: Adapting CAHS using a partnered approach to assess the scale and spread of research and innovation at the provincial health ecosystem level—partnership for research and innovation in the health system (PRIHS) program

To implement broader scale and spread of sustainable health innovations using a systems approach, Alberta Innovates,

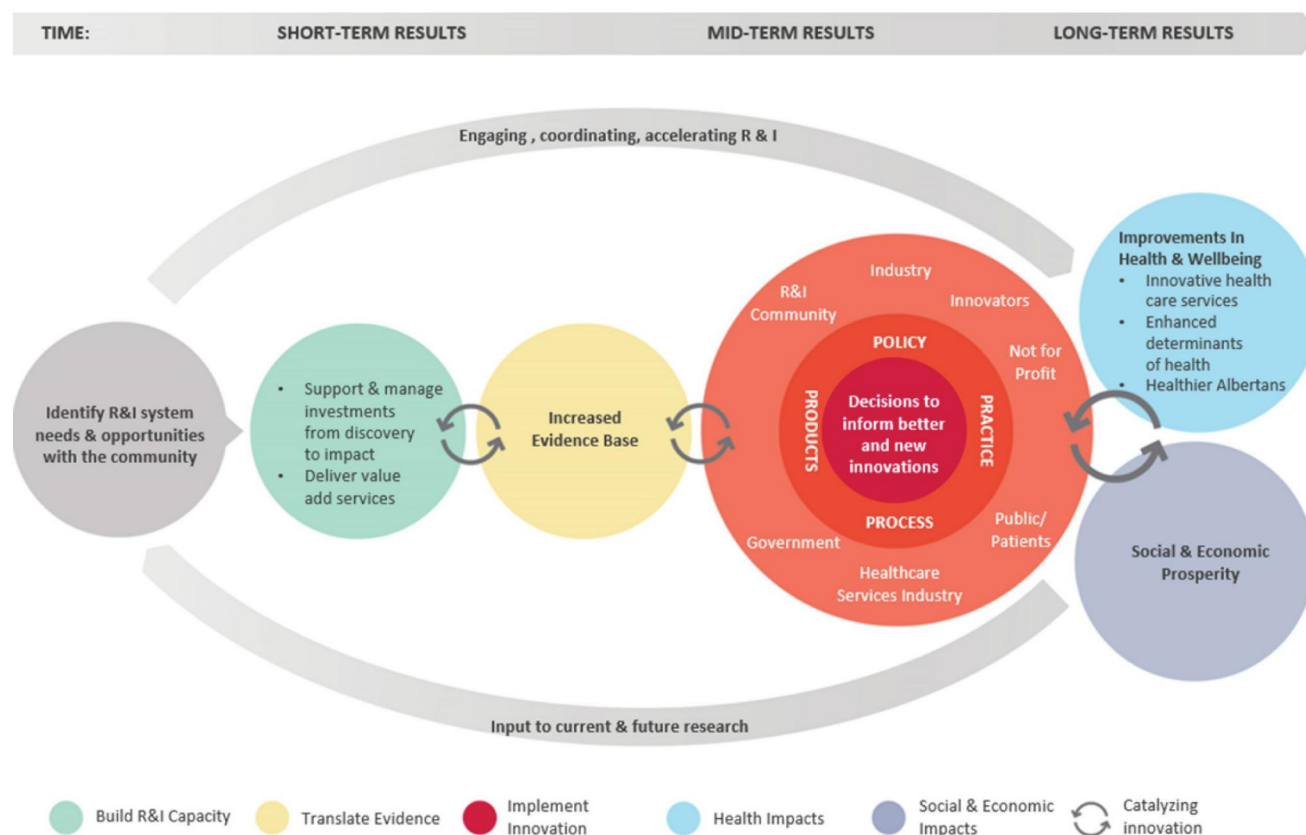


Figure 3 AIHS health research impact framework.

Source: [Graham et al. 2018](#)

(originally as AIHS), and Alberta Health Services (AHS) created a Partnership for Research and Innovation for the Health System (PRIHS) Program. Using a co-design philosophy, a shared impact framework that traces the translation of research to practice and impact was deemed a useful approach for creating a shared vision between partners, as well as creating a common language and set of tools. By fostering collaboration, “*PRIHS accelerates health research and innovation outcomes into the areas of strategic priority and need, with the potential to scale and spread to other patient populations and/or areas in the health system.*” [Alberta Innovates \(2024b\)](#)

The early iterations of PRIHS not only aimed to understand the importance of how to scale and assess locally funded projects for greater impact but also to promote the value of examining and adopting existing research knowledge from elsewhere to the Alberta context to address healthcare gaps ([Alberta Innovates 2024b](#)). At that time, both Alberta Innovates and AHS were both implementing the CAHS impact frameworks. Given the strategic alignment, it was decided that the PRIHS program would collect and report data according to the CAHS five impact categories (i.e. advance knowledge, build capacity, inform decision making, health and broad social-economic impact). In addition to collecting information on six CAHS sub-categories relevant to the healthcare system (i.e. acceptability, accessibility, appropriateness, effectiveness, efficiency and safety – see [Fig. 2](#)). Furthermore, a high-level stage gate process was developed to inform the selection of research projects for scaling across the AHS pipeline with associated integrated processes and tools.

The partnership between the various groups and the co-investment approach was described in a series of presentations at an Implementation to Impact International Summit held in Alberta in 2019 ([Hanney et al. 2020](#)). At the summit, PRIHS was described as taking a holistic systems approach. Therefore, the WHO’s framework for analyzing health research systems noted earlier ([Pang et al. 2003](#)), was used to provide a structure to present the summit proceedings. In one session a team from Alberta described the AHS Innovation Pipeline ([Hanney et al. 2020](#), p.10) that spoke to how PRIHS was one of a portfolio of programs for testing, implementing and scaling across the pipeline, and impact was described according to the CAHS five impact categories.

Nancy Fraser from the Albertan Health Services—Critical Care Strategic Clinical Network explained that members of PRIHS were part of the network “*coming together to solve problems and advance care ... a bi-directional dialogue that allows the health system to identify gaps and feed them into the research community to solve.*” ([Hanney et al. 2020](#), p.9). From Alberta Innovates, the VP for Health, showed how their role had moved on from a “*fund and forget*” model to a new type of model with much greater involvement of the funder throughout the processes. Alan O’Connor and Kathryn Graham’s impact assessment of the work of PRIHS noted the importance of “*horizontal structures*” and “*integrated processes*” and highlighted the key role of impact by noting that “*having a shared vision of impact sustained the partnership over the years.*” ([Hanney et al. 2020](#), pp.11 and 14). The development and application of the initial PRIHS impact approach were contemporaneous with much

of the work described in Phase 2, given at the time the leadership of Cy Frank at Alberta Innovates. Crucial to the evolution of the impact team's work and lessons learned was the identification of the necessity of including perspectives from a system that involves a range of interestholders (e.g. patients with lived experiences). Building on emerging evidence (Hanney et al. 2013), another key learning was the importance of the organization's absorptive capacity and workforce receptor capacity to scale. It was these learnings that the Impact Action Lab (IAL) took later and highlighted the importance of people as well as organizational roadmaps and associated tools for implementation.

Phase 4: Initial development of an adaptive impact management approach for partnered cross-sector initiatives at the provincial ecosystem level—the performance and impact management system (PIMS)

Phase 4 describes the development and features of the initial Performance and Impact Management System (PIMS) that evolved as a result of applying the approach to health and building on the learnings (as described previously) to other sectors. Initially, in Phase 2 we adapted CAHS to a health research funding organization, that evolved to PRIHS, a partnership initiative that focused on scaling to improve health outcomes in the province. Phase 4 describes the increasing need for a sector agnostic systems approach with relevance to multiple partners (i.e. government ministries, funders, industry, researchers and end users). As well as applicable to complex initiatives that were addressing societal challenges such as climate change and regional economic development. Then Phases 5 and 6 cover specific applications of PIMS which have contributed to its further development.

Alberta Innovates provides funding, business advice and connections, applied research, and industrial testing facilities to accelerate research and innovations that benefit Alberta in four main areas (economic, a sustainable environment; health; and social well-being). It was proposed that the Analysis and Learning that came from evaluation as part of a systems approach, could help facilitate greater impact. Therefore, the Alberta Innovates IAL team developed PIMS. Key features include: designing for impact upfront, embedding impact when implementing R&I, collecting routine performance management and evaluation information to track progress, as well as assessing the achievement of impact over time.

When implementing PIMS, impact strategies and plans are developed prior (ex-ante) to a major challenge type investment to inform the creation and assessment of impact. They help with strategic alignment, improve organizational relevance, efficiency, and the effectiveness of impact generation, and improve the quality of evidence collected. PIMS is a fit for purpose process for aligning and embedding impact processes in a systematic fashion. There was increasing recognition that standard monitoring and evaluation approaches and tools were necessary but deemed insufficient for assessing impact at the ecosystem level, and a more holistic systems approach was needed as part of an overarching impact management system. PIMS starts with key guiding principles:

- co-development and co-implementation to create an impact culture;

- strategic alignment and collaboration using cross functional teams;
- balancing evidence-base rigor with feasibility;
- use of adaptive management approaches;
- fit for purpose and proportionality; and
- learning and continuous improvement to iterate and innovate.

PIMS embeds impact as part of a holistic (pre, during and post initiative) R&I lifecycle approach to better inform decisions and facilitate course correction and adjustment as part of a continuous impact improvement philosophy. PIMS uses the graphic representation called the “*House that Impact Built*” and shows integrated system components as rooms and floors in the house that need to be considered during implementation as outlined in Fig. 4. Figure 4 outlines the components of PIMS that come into play at different stages of the R&I funding lifecycle, and how they interact with each other in the achievement of targeted impact. The following four sub-sections describe in turn the four floors of the “*House that Impact Built*” from the top downwards.

Impact by design and strategic alignment

PIMS systems enables users to design for impact up front while planning with the desired end state (outcomes/deliverables) in mind. Building on the various approaches described earlier, such as the Payback Framework's emphasis on needs assessment through collaboration with potential users (Buxton and Hanney 1996), the “*House that Impact Built*” starts with identifying targeted impacts to establish the North Star for the organization via development of an impact framework. Once consensus is reached on the desired outcomes and impacts via an interestholder engagement process, an environmental scan assesses external demand and needs, including sense making and strategy alignment.

Culture and partnership

An integrated business and impact plan is then developed that includes identifying the internal culture and partners needed to help effect the change necessary to achieve intended impacts, while at the same time identifying external partnerships needed to marshal resources to execute on strategy.

Implement and scale

Execution includes aligning investment goals across a portfolio of programs, conducting due diligence, and supporting researchers and innovators by providing them with navigational roadmaps. This is often the floor which seems to be missing.

Impact assessment and frameworks

The “continuously assess” floor traces different implementation strategies to measure their progress in achieving outcomes, as well as monitoring and evaluating the effectiveness of a portfolio management approach across the innovation lifecycle. This evidence helps organizations manage and course-correct along the way as well as forming the basis for

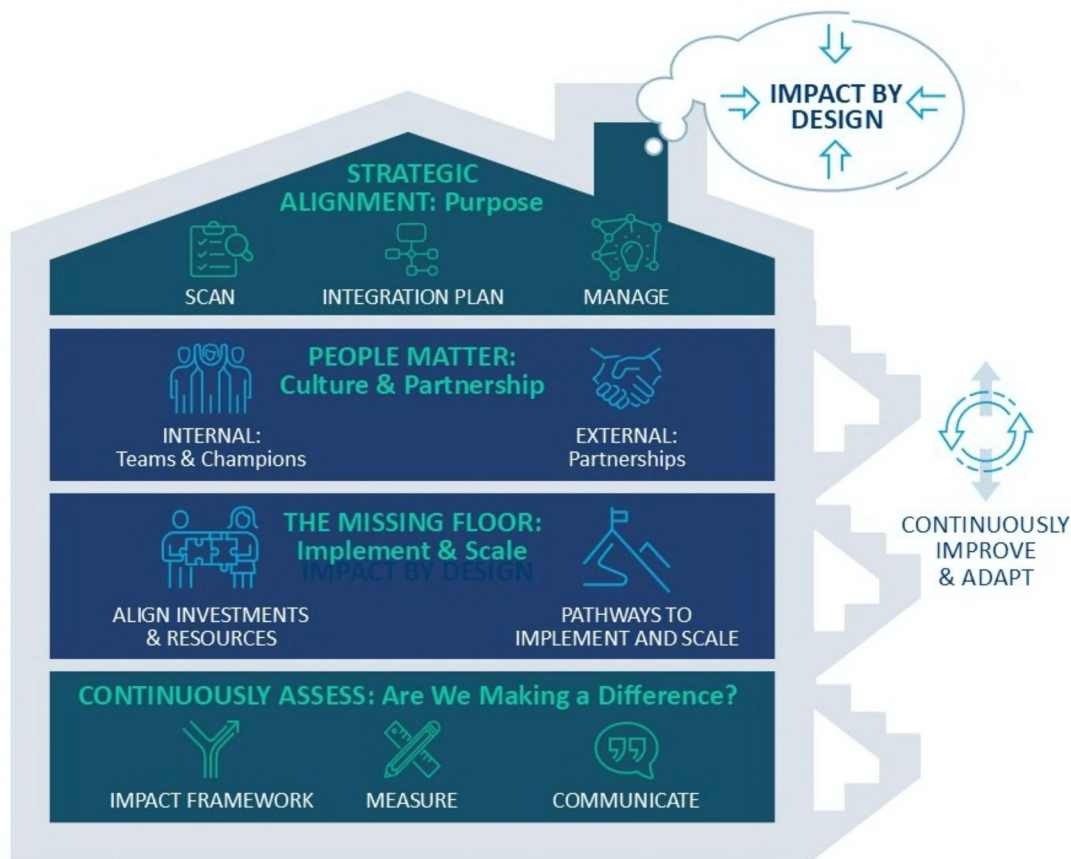


Figure 4 Alberta Innovates' Performance Impact Management System (PIMS): The house that impact built.

Source: Grant 2024

reporting and communicating societal and economic impact to beneficiaries.

Impact frameworks are useful at an ecosystem and organizational level as they provide a common language and tools that can help implement efforts, putting the client and beneficiary in the centre. Sub-national ecosystems and organizations use frameworks and systems to help them evidence the impact they have achieved and communicate their performance story. This helps guide “key implementation pathways to impact” that are co-identified as critical actions to realizing impact.

As part of PIMS, a “fit for purpose” impact framework for Alberta Innovates was developed. This framework is based on best practice evidence evolving from the various approaches described earlier, starting with the Payback Framework and including the recommended processes for responsible research assessment (Adam 2018). Alberta Innovates' mission and strategy informed the customization of the Alberta Innovates Impact Framework, which helps coordinate investments and efforts for greater impact across Alberta Innovates' focus areas. The final version of the framework presented took time and several iterations to develop and is described in Phase 6.

The impact framework as per Fig. 5, is conceptualized in the non-linear “*Splash and Ripple*” diagram. This is an apt metaphor to communicate outcomes and impacts and is particularly fitting to the dynamic and diffuse nature of R&I. The drop represents Inputs that include investments, human resources, partnerships and implementation strategies and services. The act of dropping a pebble into a pond represents Activity such as implementation actions, products, and services. When the pebble

reaches the water, it creates a splash. These are Outputs, the direct results of our actions and services. The ripples, spreading out from the splash are Outcomes, the changes and effects we are targeting and then later over time working with our partners and others to achieve economic and social Impact.

The framework identifies the pathways from investments to outcomes and impacts. The various elements are described below:

- **Co-investments:** through these Alberta Innovates, partners and collaborators support and enable R&I at various stages along the R&I continuum of **Discovery** (creating new knowledge, typically conducted at a university), **Develop** (taking the new discovery and developing it for a specific application) and **Use** (applying the developed research to address real world problems). Investments are also broken down by key strategic Focus Areas (e.g. artificial intelligence, digital health etc.)
- **Enabling outcomes:** these include changes arise because R&I investments and activities **Enhance a Talented Workforce** (increasing Alberta's talent capacity and skills to conduct leading edge research and innovations), **Advance Discoveries** (creating and sharing new ideas with those who can use them) and **Enable Technology and Platforms** (building and providing access to one stop technology and platforms). These enabling outcomes establish the conditions for the next step.
- **Strengthening ecosystem outcomes:** these arise through a **Vibrant Entrepreneurial Environment** (fostering engagement, connections, and community), **Innovation, Commercialization and Scale** (use, commercialize, grow



Figure 5 Alberta Innovates Impact Framework: Splash & Ripple.

Source: Grant 2024

and scale ideas, innovations and companies), and, in turn, these create **Competitive Industries & Companies** (increasing R&I productivity as well as strengthening competitive industries and companies regionally).

- **Collective Impacts:** these are the “so what” of R&I for Albertans. This is where R&I becomes real in the lives of citizens through tangible improvements in a **Prosperous Economy**, a **Sustainable Environment**, **Healthier Communities** and **Enhanced Social Well Being**. Impacts such as these are only achieved through collective efforts of multiple actors, with many different contributions making up the pieces that come together over time to ultimately achieve the big picture impact.
- **Benefits for Albertans, Canada and the World:** Alberta Innovates works together with others to generate and optimize the value of R&I. Those who benefit are primarily Albertans (e.g. academia, researchers, community groups, entrepreneurs, companies, governments, industry, investors, practice leaders and public). However, given that R&I has “no borders”, Canadians and citizens internationally also benefit.

This holistic R&I impact framework takes into account broader societal impacts that go beyond science and economic impacts. Guided by the impact framework, PIMS measure the outcomes and impacts of the portfolio of programs to ensure investments are effective at achieving the intended results. For Alberta Innovates, these are included in Annual Reports (<https://albertainnovates.ca/impact/annual-reports-publications/>). PIMS also utilizes an integrated impact plan ex-ante, formative and realist impact assessments during the program cycle and ex-post program assessments at completion and follow up. Results are used to determine the value of investments and to identify new strategic focus areas for investments.

Phase 5: An initial application of PIMS to a climate change innovation and technology partnered initiative at the provincial ecosystem level

An initial application of PIMS occurred in 2018 when the “House that Impact Built” was in the early stages of being

developed and the Government of Alberta launched a Climate Change Innovation and Technology Framework (CCITF). This was intended to guide investments in innovation and clean technology to address the challenge of reducing greenhouse gas emissions while preparing the province of Alberta for the lower carbon economy of the future. A tranche of funds was provided to three organizations: A Government of Alberta Ministry, an Environmental Crown Corporation and Alberta Innovates. The three organizations were charged with developing and implementing an integrated portfolio of services across the technology continuum and reporting on collective impact. The objectives of CCITF were to use innovation and clean technology to accelerate the shift to a lower carbon economy to generate significant environmental and economic benefits in Alberta by 2030.

Given the large undertaking of rolling out funding—and the requirement of service delivery and economic and environmental measurement across three very different entities—a connected, coordinated and impactful approach was needed. An early version of PIMS was applied to program design, implementation and management to achieve the intended outcomes by identifying key system components that needed to be integrated across the lifecycle of the various grants and across the three organizations. This included:

- An integrated collaborative governance structure where the first iteration of an interdisciplinary team that included an impact specialist and master implementor was piloted, given the size and complexity of the initiative.
- A new collaborative integrated client journey approach to service delivery that provided an end-to-end roadmap to navigating the commercialization pathway across technology readiness levels.
- The formation of a joint working group that developed and implemented a shared greenhouse gas quantification and economic impact methodology across the three entities.

To foster a culture of impact, cross functional teams were created internally and with representatives across all the partner organizations. New structures and processes were

developed across these teams such as quarterly meetings on how best to collect data, analyze and report in a harmonious fashion that allowed for collective impact reporting. Organizational learning that focused on staff capabilities, mobilizing knowledge and innovation was addressed by creating a series of feedback loops such as forums where practices and learnings were shared and joint brainstorming was facilitated regarding future trends. Such learning involved both individual and collective dynamics, supported by the development of tools, methods, approaches and reflection to encourage changes, improve impact and facilitate a positive mindset to impact. The objective was not only accountability, but to shift to a learning culture that took a formative approach to understanding the effects of innovation as well as engaging more diversified organizations and groups. The initiative resulted in considerable ability to measure job creation and greenhouse gas reductions in part to assess environmental impact. Environment impact was a new dimension to the R&I framework given the initiative purpose. Many components were scaled to other programs including shared learnings and implementation tools. These included:

- The importance and power of shared objectives, and the benefit of intentionally creating a positive culture that promotes cross team and cross ecosystem collaboration as a platform for enhancing and scaling impact.
- Harmonizing methodologies for monitoring and assessing impact is a long and resource-intensive process but can help with allocations for impact.

Phase 6: A full application of PIMS to the scaleup and growth accelerator program partnered initiative at the provincial ecosystem level—optimizing the impact

This example represents the most recent and comprehensive application of the “*House that Impact Built*” approach and demonstrates how the “fit for purpose” principle was used to build a tailor-made solution (see Grant 2024, Chapter 2, for a more detailed discussion).

The IAL was asked to help enhance their entrepreneurial service offerings to Alberta companies. More specifically, to address another challenge initiative of bridging the scaleup gap for companies across the R&I continuum where, like in the rest of Canada and the world, the survival and success rate of scaling companies is very low, but the economic benefit is high.¹ The investments business area of Alberta Innovates wanted to identify the gaps and trends and design a scaleup program to specifically fill those gaps. They also felt that the solution needed to create an inclusive collaborative governance framework, and opportunities for shared learnings, and thereby contribute to strengthening the innovation ecosystem by enhancing the entrepreneurial culture in Alberta. They recognized that PIMS used an adaptive impact management and assessment approach and could be fit for purpose to the context of entrepreneurship and used in working with entrepreneurs post-COVID, to keep up with the speed of business across an ever evolving and complex supply chain.

The work began on this project in late 2019. The visual representation of PIMS contained in Fig. 4, the “*House that Impact Built*”, outlines the tools and steps associated with each floor.

The top floor—IMPACT BY DESIGN AND STRATEGIC ALIGNMENT

As indicated in the account of Phase 4, the PIMS design process starts by clearly identifying the North Star—the vision, objectives, and targeted outcomes for the program. The Alberta Innovates Impact Framework is presented in the “*Splash and Ripple*” diagram. As shown in Fig. 5, it represents the impact logic model as described in the impact assessments and frameworks section. (Here we discuss the impact framework in terms of its contribution to setting the purposes of the program—the actual implementation of the framework comes in the Ground Floor).

The Scaleup and Growth Accelerators program was aligned and focused on strengthening ecosystem outcomes identified in the Alberta Innovates impact framework (vibrant entrepreneurial environment; innovate, commercialize, scale; competitive industries and companies). Specific targeted objectives for this project were identified: address scaleup gaps to help Alberta ventures scale and grow, diversify Alberta’s economy and drive Alberta’s global innovation mindset with targeted outcomes of creating new technology firms, jobs and revenue and creating social and community impact through network effects and global connections while enhancing equity, diversity and inclusivity.

A comprehensive **environmental scan** was completed over two years from 2019 to 2020 to fully understand the scaleup ecosystem needs, priorities, gaps and future state opportunities (Raby 2021). The scan included commissioning reports to conduct a landscape analysis to identify the gaps (Raby 2022) and conducting a qualitative metanalysis on incubators, accelerators and network effects (Gregson 2019, 2021, 2022) to inform assessment of network relationships. It also included a leading practice forum that invited international guest speakers to share lessons learned and “good practices” from their jurisdictions. In addition, an evaluation of local accelerator pilot programs was commissioned to understand local capacity and highlighted the role that leading global accelerators could play in transforming local economies—a policy and funding tool that was not previously used by Alberta Innovates. The scan was used to inform the development of a scaleup and growth **strategic plan** that included two pillars: the use of global accelerators via an integrated performance framework managed by Alberta Innovates and a Fellowship approach to supporting entrepreneurs via an alumni network to strengthen relationship building and share knowledge.

Complementing this, an **integration and management** approach was designed that applied a “*Roadmap for Growth Playsets*” concept for effective implementation and to further embed an impact culture given lessons learned from the environmental scan. The premise was that if you want a thriving entrepreneurial ecosystem, there are four interconnecting playsets instrumental to executing an innovation roadmap across the client journey. The roadmap consists of various elements: *Mindset* (fostering an entrepreneur leadership state of mind), *Teamset* (the people needed across different disciplines to achieve collective impact), *Toolset* (access to the relevant tools for the team to execute the roadmap), and *Impactset* (design for impact strategically up front and integrate progress measurement, monitoring and evaluation across the program lifecycle).

We saw in the description of PRIHS in Phase 3 how Alberta Innovates, as the funder, was moving away from the “*fund and forget*” model, towards playing a more active role. Here this is seen as a “*fund and fellowship*” model or pillar that focuses on collaboration and connection to further an impact culture and is the thread that connects the playsets. This Fellowship pillar was designed to establish the conditions for strengthening an ecosystem that promotes entrepreneurial growth that includes:

- using Learning to accelerate getting to the next growth horizon;
- creating a Culture of innovation and impact;
- building a connected and inclusive Community; and
- fostering Collaboration across all ecosystem players.

The premise was that institutionalizing fellowship would help generate a network effect that creates entrepreneurial capital and would be one of the key pathways to realizing impact. The Scaleup and Growth Accelerator program conceptualized entrepreneurial capital as the amalgamation of financial, social, cultural and human capital. In this framework the mix of capitals influences the entrepreneurial journey, and all aspects need to be supported for the company to achieve maximum outcomes. In particular, a key learning from conducting a retrospective realist impact assessment on the Regional Innovation Networks of Alberta was the importance of trust and trusted relationships (social capital) to getting to outcomes and impacts (Grant 2022).

It became apparent that implementing an impact systems approach requires a specific set of skills that traditional project management does not provide. A novel approach to implementation was establishing a new impact triad team that combined the expertise of an Impact Strategist who provided the Impact Frame, a Master Implementor who knitted the threads or components of the “*House that Impact Built*” holistically together, and a Business Unit content expert. To apply the model, they worked with other team members like a program/project manager in addition to having access to specialized experts such as an evaluator/analyst, a knowledge broker, and a communications specialist. The rationale for the triad approach was the ability to scale at an organizational level as well as having a core team that is experienced at implementing and scaling at an ecosystem level. The combination of this impact team with access to specialized expertise and practices was one of the keys to success.

The third floor—PEOPLE MATTER

Fundamental to the PIMS model is a focus on **PEOPLE** as key to establishing an Impact culture and partnerships as part of the secret sauce for amplifying impact. The Playsets and Fellowship approach were used to create a set of guiding principles for program design and implementation which included co-development, capacity building, sustainability, learning and Accessibility, Belonging, Inclusion, Diversity and Equity (ABIDE) (National Collaborative for Digital Equity 2020). **Internal teams and champions** were identified and provided with implementation playbooks. For **external partners**, a co-funder consortium was established at the municipal, provincial and federal government levels to bring the

Scaleup and Growth Accelerator Program to Alberta, unifying around the ultimate goal of bridging the scaleup gap.

The second floor—MISSING FLOOR

The next step in the PIMS model which we refer to as the missing floor was to **align investments and resources across the pathways to implement and scale objectives**. Using the North Star objectives, a Request for Proposal was designed to select the best “fit for Alberta” accelerators who would be most likely to meet the program goals and key performance indicators. Performance criteria included Relevance to Alberta, Excellence of the Accelerators, Feasibility of implementing the targeted model in Alberta, Innovation value-adds and ability to obtain targeted Outcomes and Impact which included a weighted score for an ABIDE strategy.

Service delivery roadmaps were developed to guide program implementation and were embedded and translated into a suite of program tools from service agreements with the accelerators, orientation packages, procedures etc.

The ground floor—CONTINUOUSLY ASSESS

A PIMS evaluation working group was struck to co-develop an **impact framework, measurement methodology and communication strategy** with accelerators and co-funders. A comprehensive whole lifecycle (pre, during and post) data collection methodology was developed and tracked inputs, activities and outputs of the program out to three years post to allow time for outcomes to be achieved (see Fig. 6). This information was collated and shared back to the accelerators and co-funders in “*Lesson Learned Huddles*” after each Accelerator cohort was completed, so it could be used to foster **continuous improvement and adaptation**. Annual reports and a set of cascading scorecards were developed to monitor, evaluate and communicate program benefits and respond to requests for return on investment accountability. In addition, a series of impact narratives were collected from the participating companies to showcase qualitative benefits.

A unique feature of the continuing assessment was the delivery of a four-day scale and growth forum called “*Leading in Learning*” that shared the model and initial results with the local and global community for learnings and ongoing culture development. The scorecard for the end of the second year of the three-year pilot Scaleup and Growth Accelerator program showed early promising results and very positive feedback regarding the embedded PIMS and Fellowship approach, as shown on Fig. 7 (Grant 2024).

A formative realist impact assessment in the third year was completed to validate the program’s return on investment and leverage learnings from the pilot phase into full model scale up (Grant 2024). The rationale for a realist impact assessment is to understand the context, mechanisms and outcomes/impacts (CMO) that were generated from a real-world application in practice (Pawson and Tilley 1997). Realist theory is based on understanding what works in what contexts, how, and for whom (i.e. in “real” life) rather than does it work. A key finding from the assessment is that the Scaleup and Growth Accelerator Program has increased the entrepreneurial capital in Alberta (Grant 2024). The concept of entrepreneurial capital has been debated for some time in the academic literature and captures entrepreneurial competence and commitment (human capital), networks (social capital),

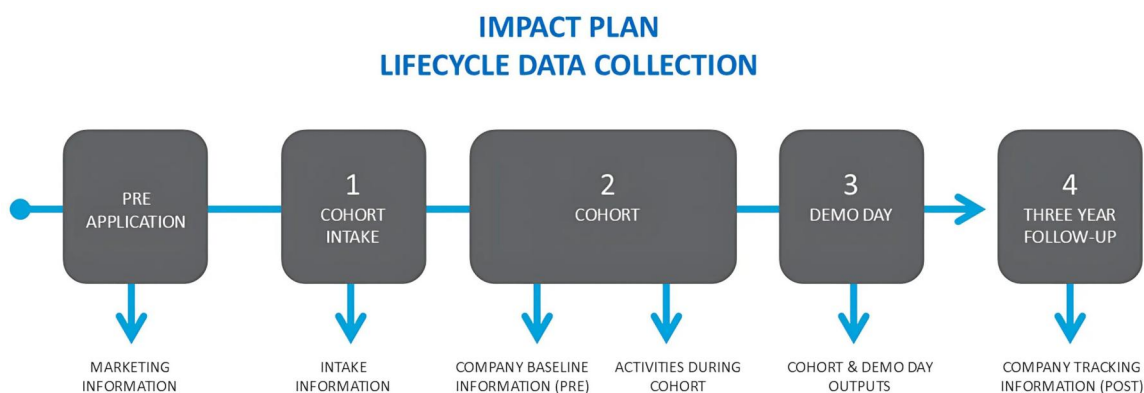


Figure 6 Impact Plan: Lifecycle data collection.

Source: Grant 2024

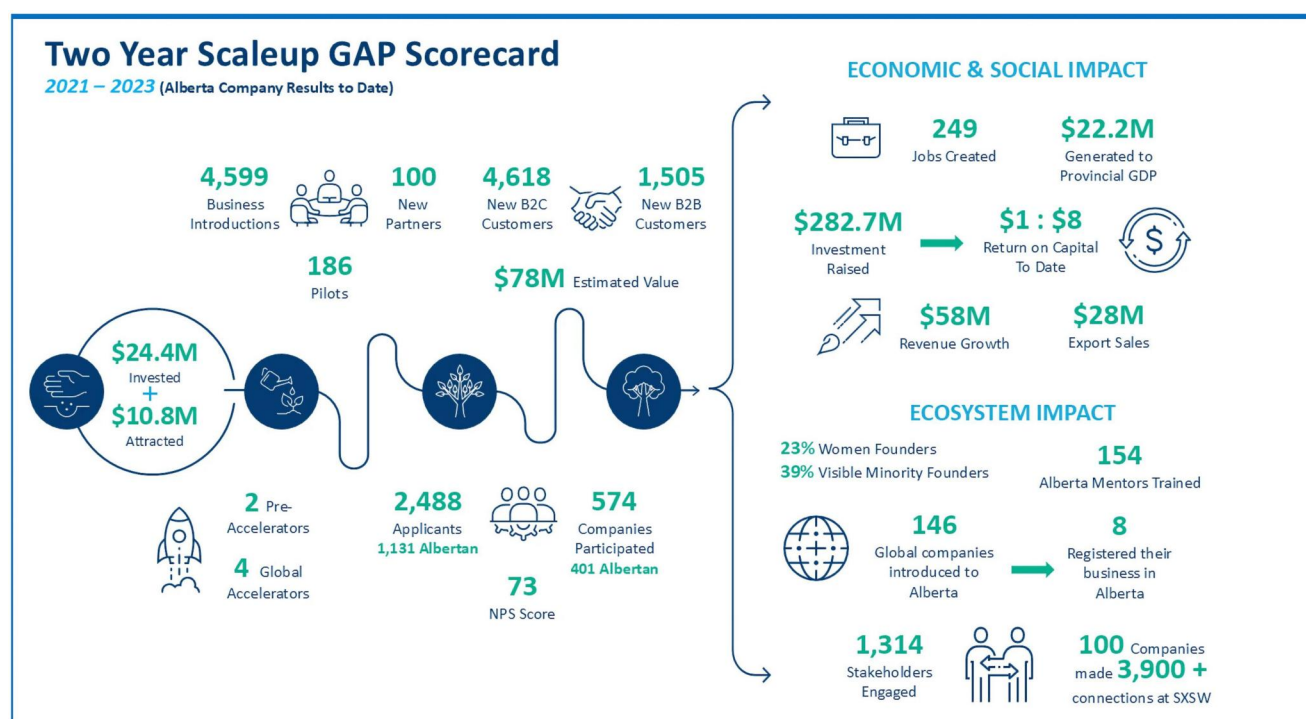


Figure 7 Scaleup and Growth Accelerator Program (GAP) Scorecard.

Adapted from: Grant 2024

prestige, symbols and signals (cultural capital) and investments, funding, revenues etc (financial capital) as illustrated in Fig. 8.

Discussion

The underlying premise and thread of our work was that it was possible to build on ways to assess the impact from research to create a system which would increase the chances of achieving wider impacts (i.e. returns) from research. In doing this, the team was using evidence base practice (i.e. best available research evidence) with practice-based evidence (i.e. evidence from real world practice) as a mechanism to inform decisions, share learnings and insights on how initiatives work in real-world settings. The paper traced the development of, and from, research impact assessment in Alberta since the first international application of the UK-developed

Payback Framework (Buxton and Hanney 1996), which took place in Alberta in 1999. The intention behind the original development and application of the Payback Framework in the UK was not only to assess the impact from health research, but to identify ways of enhancing such benefits. Applications of the Payback Framework by the original team members and others to the portfolios of various funders of health and biomedical research did identify how the impacts identified had been achieved and indicated possible ways in which further impacts could be achieved in the future (Wooding et al. 2005 and Hanney et al. 2013a). However, none of these studies reported on, let alone became part of, an initiative to design impact from the start of a program. Using the terminology of the 4 As of research impact assessment (Accountability; Advocacy; Allocation; and Analysis—(Morgan Jones et al. 2013) the Payback Framework was originally mainly used for Accountability and Advocacy, but an

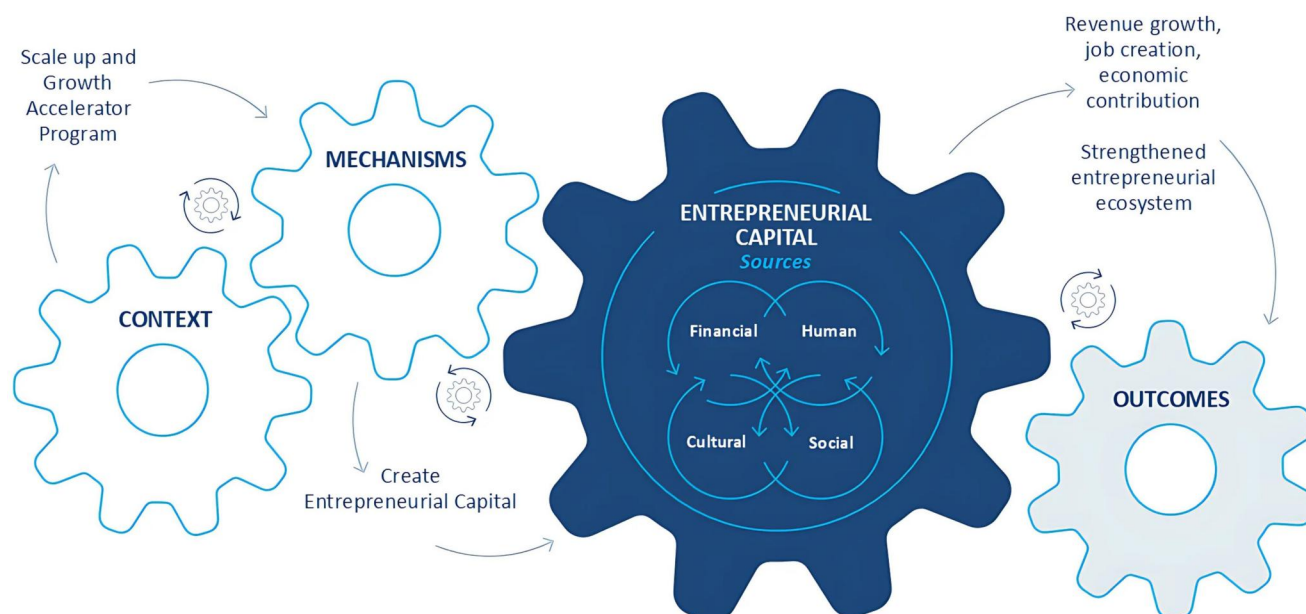


Figure 8 Entrepreneurial capital.

Source: Grant 2024

interest in Analysis was there from the start. This was facilitated by the interactive perspective, and a focus on collaborative priority-setting incorporated from the work of Kogan and Henkel. There is now a very recent, example of using prospective research impact evaluation to enhance the level of impact achieved, but the account of that development serves to highlight the immense challenges in making progress in this field (Balling et al. 2025).

The original work in Alberta on retrospectively applying frameworks for evaluating the impacts of health research was primarily aimed at providing accountability for research funds already allocated, but it soon began to go further. As noted, the development of the CAHS framework also identified the importance of learning from impact assessments to “help guide better health research investment decisions in the future.” (CAHS 2009, p.36). Later, this early work increasingly provided a crucial base on which continuing development and application to the innovation field was possible (Graham et al. 2018). Given the developmental, iterative, and experimental nature of the applications in practice, the emphasis moved increasingly towards a more holistic understanding of the processes for effective implementation to generate and then scale for impact beyond the health sector. This fit for purpose activity occurred iteratively in the context of the research funder, shifting its approach, perhaps fuelled by greater political confidence in the value of funding.

In practice, however, there is a real challenge in scaling evidence and innovations to other jurisdictions and populations (Greenhalgh and Papoutsis 2019). Another shift was the greater appreciation of enabling and fostering a positive impact culture beyond purposes of accountability and allocation (more extrinsic motivation) to analysis and adaptation (more intrinsic motivation) as part of an adaptive learning eco-system and enabler for implementation (Institute of Medicine 2013; Phipps et al. 2025).

In terms of underpinning evaluation theory, Caffrey and Monro (2017) suggest that there are three evaluation paradigms—logic models, systems-based approaches, and realist

evaluation. In terms of our theoretical evolution, we started applying impact frameworks that used logic models, as we evolved and iterated, we enhanced the systems components that had always been part of these frameworks to address the complexity and non-linearity of research and innovation. Going right back to the influence of the work of Kogan and Henkel (1983) on the development of the Payback Framework (Buxton and Hanney 1996), we have seen how taking a systems approach to health research highlights how interactive approaches increase both the chances of achieving impact, and of being able to conduct an evaluation that identifies the impact that has arisen.

The PIMS approach also emphasized flexibility, and responsiveness to address uncertainties and complexities in evaluating and managing multifaceted impacts across various industries and sectors (Garmestani and Allen 2015). By adopting and integrating adaptive management principles organizations can enable innovative strategies that enhance their resilience and productivity and position themselves to navigate the complexities and uncertainties (Ramalingam 2013; Dowd et al. 2025). In addition, our journey occurred over time and we learned from our experiences in a way that we noted in the Introduction had been suggested (Rogers and Macfarlan 2020). As highlighted by the adaptive management literature, we experienced similar barriers that hindered effective implementation. These included, the lack of resources (financial and human) and/or right resources and partnerships for program or ecosystem implementation, data collection, monitoring, and investment into relevant technologies, as well as changes to management policies and leadership (Jacobson et al. 2006; Westgate et al. 2013). Implementing a fit for purpose performance and impact management system required knowing which components need to be adapted, at what level, and when it should be done in what context.

Organizational change originates internally. As such, as employees empowered to learn through innovation, the generation of ideas and insights are needed to bring about

significant transformations to drive impactful change (Hill et al. 2015). This internal transformation, however, relies on an external collaborative community that is both willing and adept at innovating, with shared purposes, values, and rules of engagement. A key challenge experienced was the lack of impact implementers experienced at implementing large complex challenge initiatives at the level of the ecosystem as well as impact strategists who integrate design thinking upfront into these initiatives to implement and scale successfully. These have been challenging roles to fill given that these jobs are new and the science and practice of impact is relatively nascent. We adopted a team-based triad model with a core team that included an impact strategist, a master implementer and a domain expert with broader access to a team of specialists such as evaluators, data scientists, and experts in knowledge mobilization, quality improvement etc.

The assessments found that by promoting collective ownership, embracing diverse perspectives, fostering effective team dynamics, and prioritizing continuous learning and measurement, organizations can enhance their chances of achieving sustained and long-term success in making a positive impact as they navigate the complexities of our current landscape. The lack of absorptive capacity and the absence of an impact platform with practical tools for implementation was challenging and consequently a lot of effort was used to develop new or customize tools for each initiative. This speaks to the balancing of fidelity (implementing the tool as designed) versus adaptability (adapting to the local context to increase adoption and use) that is highlighted in implementation science (Moore 2023). At the same time, there is increased international evidence supporting the absorptive capacity concept where staff in a system are research active, are more likely to understand and implement research finding from wherever they come (Boaz et al. 2024).

Overall, a major strength of this paper is the exploration of the sustained methodological developments undertaken by the Alberta team, over 25 years, in the context of both some of the main international developments in research impact evaluation, and the developing approach of the local research funder. A limitation of the paper is that, inevitably, there is not space to cover in detail some aspects of the methodological developments and associated practical applications.

Theoretically, Zakaria, Grant, Luff (2021) highlight the dominance of the logic model in assessing research and a lack of studies fully using either systems approaches or realist evaluation in the context of assessing Research and Innovation impact. However, our work on conducting realist impact case studies for the Regional Innovation Network of Southern Alberta and Alberta Innovates' Accelerator program has highlighted the importance of understanding network effects and how trust is key to building thriving networks and clusters (Grant 2022, 2024). The shift from the research focused evaluation to innovation focused evaluation is also matched by a methodological evolution from the primary focus on the logic model of the Payback and CAHS frameworks to using a holistic systems approach with realist theory that acknowledges the dynamic nature as well the relationships between multiple actors in realizing impact. In addition, the importance of fostering, managing, and maintaining an impact culture and embedding a mindset, building capacity, and capabilities for implementing and scaling will be continued. Experiments across different jurisdictions to learn

what works, doesn't work under what conditions for whom, and why, will continue to advance this work.

Conclusions

The evolution of starting from an application of an established framework to evaluate the impact of health research, through analysis and application of an evolving approach is outlined in this paper. We developed a pioneering system of performance and impact management that is fit for purpose to assess impact, and adaptive to uncertain environments and across sector challenge initiatives. It is a promising management decision tool and process for generating and scaling impact at a range of levels. We see a rebalancing of impact assessment to this holistic systems approach that values quantitative and qualitative methods with multiple data sources, feedback loops that combines systematic evidence for management. Complementary deep dive realist impact assessment case studies can help us understand how and why the impact has occurred and how future R&I activities can be designed to achieve further impact. We conclude that developing and implementing fit for purpose holistic approaches for assessing impact as part of an adaptive management system is promising for optimizing returns. Furthermore, we will continue to apply and test methods and theories as part of the emerging area of "research on research" to advance the science and practice of impact assessment.

Acknowledgements

We would like to acknowledge support from Alberta Innovates leadership and teams with a special thank you to researchers and entrepreneurs who were involved in the primary and secondary data collection and involvement in the development and testing of the PIMS approach over the years.

Supplementary material

Supplementary material is available at *Research Evaluation Journal* online.

Funding

This work was supported by Alberta Innovates, and no external funding supported the work or this manuscript.

Note

1. While half of all startups survive over 5 years, only 0.1% of small firms become mid-sized, and only 2% of mid-sized firms become large (Chakarova and Ruttan 2019). High growth firms contribute disproportionately to job creation and are rare (Audretsch 2012). Between 2009 and 2012, high growth firms made up 1.24 percent of all Canadian firms and accounted for 63 percent of the total net job growth (Audretsch 2012).

Conflict of interest

The authors have no conflict of interest to declare.

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