Faculty of Design

2022

Asynchronous Ecosystem Development: Micro-mapping using scanning, ZIP-Analysis, and systemic relations

May, Cheryl

Relating Systems Thinking and Design 2022 Symposium
University of Brighton, Brighton, UK, October 13-16, 2022

Asynchronous ecosystem development: Micro-mapping using scanning, ZIP-Analysis, and systemic relations

Cheryl May

London South Bank University

This presentation is a case study representing my experience with asynchronous, distributed work and is based on an evaluation project for the Canadian Business for Purpose Network. In emergent work such as this, incrementalism and uneven development are to be expected; therefore, the project was informed by a multimethod research mindset. Methods included scanning, ZIP-Analysis, and the Library of Systemic Relations, and three micro-maps were produced as artefacts that acknowledge the asynchronous nature of the initiative and an ecosystem model representing distributed networks of stakeholders. Reflexivity (Dodgson, 2019) raised questions about the realities of asynchronous and distributed work and the wisdom or folly of incrementalism in design, and a large street mural composed by several artists provided inspiration (En Masse, 2011). The mural, *Quai des Arts*, exists in parts executed asynchronously; while some sections are completed to the finest detail, others are simply pencil lines expressing the outline of shapes. *Quai des Arts* reinforced the idea that asynchronous work can be a dynamic way to progress toward goals.

KEYWORDS: bricolage, ecosystem, foresight, gigamaps, social R&D, synthesis maps, strategy

RSD TOPICS: Cases & Practice, Methods & Methodology, Mapping & Modelling

Presentation summary

This presentation is a case study based on the Canadian Business for Purpose Network (B4PN), hosted by MaRS Discovery District and funded by the McConnell Foundation. From November 2020 to March 2022, the B4PN was focused on changes in the societal purpose of business. The project described herein was conducted from February to June 2022 and directed toward two components:

1. The first deliverable and most visible effort was to evaluate and report on the re-orientation in business from shareholder primacy to stakeholder capitalism (May, 2022).
2. The second deliverable was strategic support to the MaRS Philanthropy Office for ecosystem resource development.

The evaluation team worked with the knowledge that innovation systems have a reduced potential for disruption when activities are isolated (European Commission/Mazzucato, 2018; Council of Canadian Academies, 2018), and both aspects of the project were considered in the context of system change evaluation:

> (1) the complexity of the dynamics of the system or situation of interest; (2) the complexity of the dynamics of the system change intervention; and (3) the intended users or stakeholders, purpose(s), and methods of the intervention's evaluation. (Hargreaves, 2010, p. 6)

The B4PN's strategic clarity working group provided a conceptual model for ecosystem development, envisioned a system, and highlighted problems requiring more exploration. The evaluation team recognised that applying the strategy to organisational development during the current phase would be a mistake, and problem framing was undertaken and established with care (Dorst, 2011; 2003; 2015; Svihla & Reeve, 2016). Using Arnopoulos's problem definition to prompt a search for the most "disturbing situation" (1981, p. 4) revealed that changes to the role of business in society are disruptive and introduce complexity across multiple domains. The evaluation team conceptualised strategic clarity as a map of the dynamic environment of ecosystem evolution and visualised the goal, objectives, outcomes, and stakeholders on a wheel

that can shift. The model allows all elements to be altered to reflect ecosystem changes and support complexity (Figure 1).

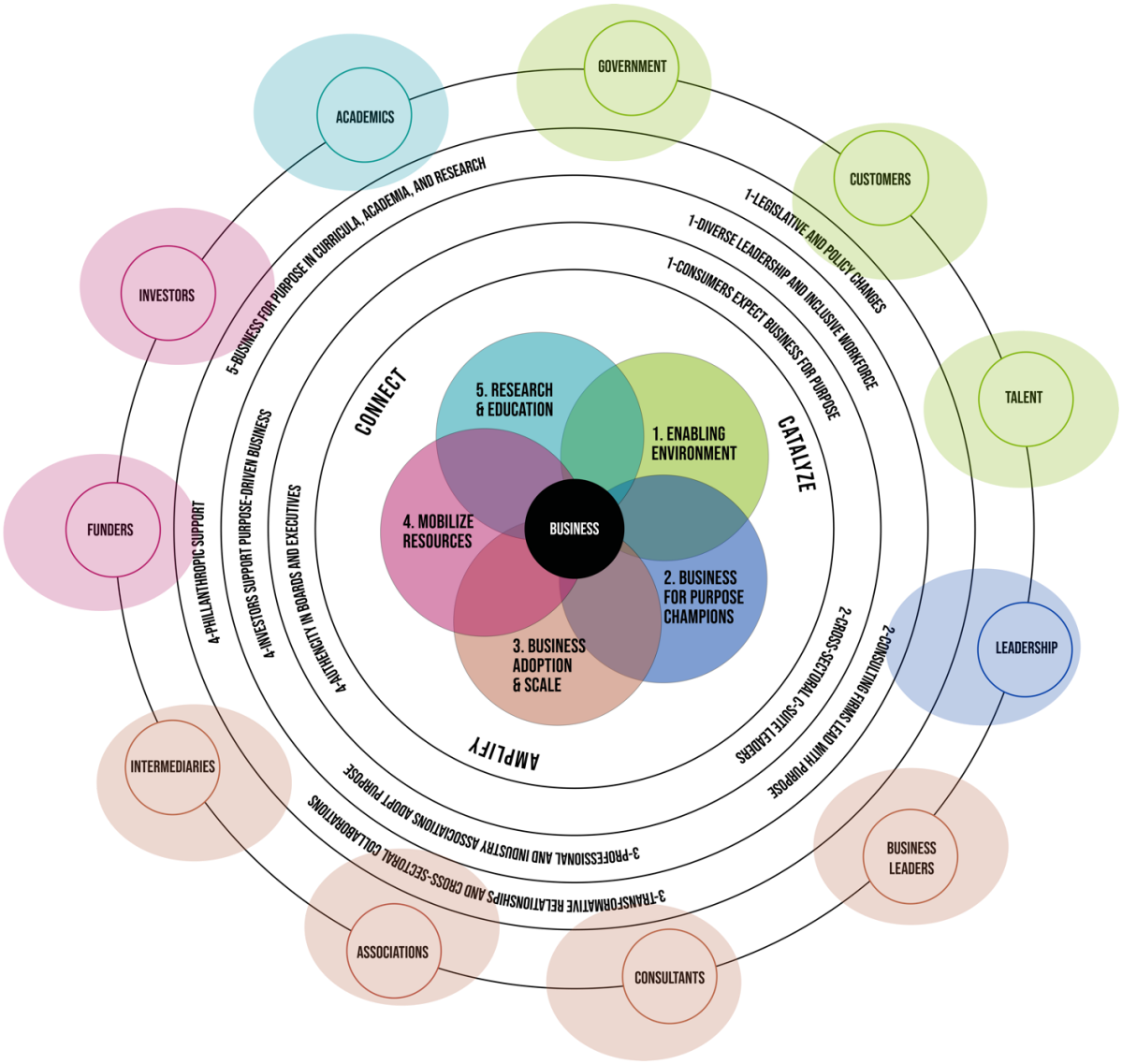


Figure 1.B4PN Strategic Framework.

Description: The “petals” are the five strategic focus areas surrounded by related imperatives, “catalyse, connect, and amplify.” Three layers contain current objectives, organised according to their intended impact on people, organisations, and systems. The outer circle represents stakeholder groups according to their primary relationship

to a strategic focus area. When conceptualised as a framework, the strategy map works well enough to support ZIP-Analysis and exploration of systemic relations.

Method

The B4PN project was grounded in a multimethod research mindset—reinforced by the interdisciplinary nature of systemic design—and establishing a rich environment for team sessions to provide inputs to a single lead researcher in a time-limited project. Scanning methods from strategic foresight were used, and three micro-maps were developed using the Library of Systemic Relations (Sevaldson, 2012a) and ZIP-Analysis (Sevaldson, 2012b). The scanning process and micro-mapping were used for analysis and synthesis in the development of the *Canadian Business for Purpose Report* (May, 2022) and to create artefacts that could serve as strategic inputs to ecosystem stakeholders and the MaRS Philanthropy Office.

Multimethod research mindset

Multimethod research was qualitative and documented to support mixed methods research that might be carried out in the future (Shorten & Smith, 2017). The project drew on approaches from incrementalism, social research and development (social R&D), and bricolage..

Charles Lindblom first described **incrementalism** as the process of “muddling through” (1959), and since its introduction, it has received criticism for short-sightedness, conservatism, and utility for analysis. Exploring incrementalism in a systemic design project opened ideas of how it might optimise the realities of asynchronous development and distributed teams. More recently, neo-incrementalism questions, “How can we become better incrementalists or better strategic thinkers and actors more generally?” (Weiss & Woodhouse, 1992)

Social R&D has a 60-year history in North America as a proven method for activating innovation in the social service sector, and, following a period of relative latency, it was reintroduced as a characteristic of social innovation in the early 2000s, a field that is attuned to the challenges of co-creation and collaboration (Langlois, Nichols & Pearman,

2020, p. 28). Vinod Rajasekaran (2016) crowdsourced a working definition for social R&D for *Getting to Moonshot*.

> So what is social R&D? [...] A combination of competency, culture, and craft that is intentionally applied to continuously learn, evaluate, refine and conduct practical experiments in order to enhance social wellbeing. (p. 8)

The goal of a social R&D process is to make sense and provide a basis for the next set of actions. (Kurvinen, 2007) and social R&D is a contributor to strategic inquiry (Schulman, Rajasekaran & Ryan, 2017). Since gigamaps are a method for design inquiry (Sevaldson, 2018, p. 244), social R&D and gigamapping approaches can be combined to support sensemaking at the intersection of strategy and design. The two methods work together with a focus on the possible, that is, "what ought to be" (Sevaldson, 2018, p. 244), and share an ethos of networks of organisations and knowledge mobilisation.

While the social R&D moonshot is action for social impact (i.e., prototyping "what ought to be"), **bricolage** creates the flexibility for "doing things with whatever is at hand" (Levi-Strauss, 1966, p. 17). Margaret Hargreaves (2021) recognises bricolage as an approach to dealing with the complexity inherent in transdisciplinary research. Designers as social entrepreneurs—and social entrepreneurs as designers—can be considered in the context of the three types of social entrepreneurs: social bricoleur, social constructionist, and social engineer (Zahra et al., 2009). According to Zahra's typology: social constructionists mend the social fabric, the social engineer rips it apart to renew it, and the social bricoleur helps to renew social harmony. Bricolage promotes sensemaking and the resilience required for disruptive environments, and collective bricolage brings together bricoleurs who thrive in low-resource environments that demand constant adaptation and experimentation (Duymedjian & Rüling, 2010).

Scanning for signals and micro-mapping

An example of bricolage in this project was the use of the B4PN weekly announcements as a rich source of signals for strategic foresight. Six activities are considered fundamental to a complete foresight project: framing, scanning, forecasting, visioning, planning, and acting; (Hines & Bishop, 2006/2015). Of these, *scanning* was met by converting the weekly announcements into a signals database. From a foresight

perspective, the process is incomplete, but scanning met the need for trend analysis, and the database artefact could serve as a reference point for a dedicated strategic foresight project. Data collection for scanning was developed from weekly announcements representing the five top business for purpose items each week. The content was set up in a database representing 380 signals, and trends were identified through content and keyword analysis and consultation with founding members. Weak signals were examined; for example, ample empirical evidence supports the expectation that words like indigenous, BIPOC,[1] diversity, equity and inclusion would rank highly; however, these were not in the top 100 words. These are known signals of change, so research was deepened in these areas.

Like an organisation, but distinctly more complicated, an ecosystem is a system; it has asymmetrical boundaries and a hierarchical structure and is transformable, permeable, and networked. (Cilliers, 2001) However, the situation of ecosystem development is complex and requires multi-dimensional viewports. Theory of change concepts and logic models are components of this, to be sure. Still, the challenge is to look deeply at areas of opportunity while holding the entire ecosystem in view. The experience of zooming in on a specific area of strategy or programming is familiar to people who prepare grants: for instance, a charitable fundraiser deconstructs strategy into a set of funding opportunities to match with donors, and a sponsorship manager in a theatre delves into each production in a season to find marketing value for sponsors. Ecosystem development demands a nuanced understanding of relationships, and for this, systemic design turns to mapping. Specifically, maps stimulate *interpretation*, that is, "They propose a hypothesis in a system" (Jones & Bowes, 2017, p. 242) and demand an exploration of the potential for what relationships might develop between what players and to what end.

[1] BIPOC represents Black, Indigenous and People of Colour. According to the US-based BIPOC project, the term is used "to undo Native invisibility, anti-Blackness, dismantle white supremacy and advance racial justice" (thebipocproject.org). It is also used in Canada but has been challenged as an American reference and a "one-size fits all" term to talk about race (cf. Constance Grady, VOX, 2020X).

Systemic design maps and descriptions of methods are in evidence in the Relating Systems Thinking and Design Symposium repository.[2] Of these, there are three identifiable types:

- The National Institute of Design maps, which use metaphor to represent the relationship between products, systems, and people. (Ranjan, 2005).
- Gigamaps come out of the Oslo School of Architecture and Design and are considered "devices for design inquiry rather than an analytical tool like those used in systems engineering or in hard systems models." (Sevaldson, 2018, p. 244).
- Synthesis maps from OCAD University "seek to illuminate design understanding and inform proposals reflected in the visual narrative." (Jones & Bowes, 2017, p. 233).

This report uses *micro-mapping* as a working term to describe the maps created within the problem space and are not a full systemic mapping activity, which concerns the broader system and global problematiques (Arnopoulos, 1981). However, it is not always possible to work on a large scale, and in the case of this project, the extended boundaries are fluid or unknown. Micro-mapping allowed zooming in on tight boundaries for the purpose of examining systemic relationships and experimenting with the dynamics of flow. Operationally, mapping systemic relations has the potential to avoid misfires in partnering and support synchronicity because examining the relations brings focus to the intention of each connection in the system and the relationships required to develop the polycentricity needed to govern an emergent ecosystem (Ostrom, 1999). The micro-maps offer partial views; they are designed to contribute to a gigamap or synthesis map, existing as artefacts that can be combined asynchronously and acknowledging that the complexity inherent in systemic change means that different parts of the system operate at different speeds.

[2] https://rsdsymposium.org/category/systems-maps/

ZIP-points and the Library of Systemic Relations

Scholarly systems literature presents a high degree of rigour and specificity that can be discouraging—one might give up upon reading Churchman's chapter "Leibnizian Inquiring Systems: Fact Nets". (1971, pp. 19-41)[3] Fortunately, there is contemporary literature directed toward systems change designers (cf. *Design Journeys through Complex Systems* encourages experimental maps and prototypes):

> Designing new value or systems change proposals can draw from any, or all, of the maps in this journey. The tools are flexible and can be trialed (in the Lab context) to define initial models for validation and dialogue. Partial maps, as prototypes, can be taken into Studio settings with stakeholders as proposed starting points, to accelerate the shared learning process and generate iterations of new ideas. (Jones & Van Ael, 2022)

While the Oslo School of Architecture and Design and OCAD University mapping courses range from six to 16 weeks (Jones & Bowes, 2017, p. 233), the development opportunities under exploration in this project called for modified systems mapping to meet the need for rapid response. Much of the extant literature encourages designers to be bold and to focus on the simplicity of mapping. Sevaldson says, "The Gigamap has proven to be an ultimate bridging device. It is easily learned and easy to apply. Especially within groups of collaborators, the bridging and synchronising effect is remarkable" (2018, p. 257). Since the idea was to practice an approach that could support incrementalism, the practice for this project held to mapping basics (Meadows, 2008), utilising causal loop diagramming (Maruyama, 1963), and embracing the principles of openness, purposefulness, multidimensionality, emergent properties, and counterintuitive behaviour (Gharajedaghi, 2011). The Library of Systemic Relations and ZIP-Analysis opened the gate to rapid mapping (Sevaldson, 2012a; 2012b), together with a further incentive that mapping can—and should—focus on relations.

---

[3]Although hard on Churchman here, his work is seminal. For a fair review (and primer) Stevens, E. (1975). [cf. Review of The Design of Inquiring Systems: Basic Concepts of Systems and Organization, by C. W. Churchman]. American Educational Research Journal, 12(1), 94–96. https://doi.org/10.2307/1162585

> To become a systems thinker, you have to turn your attention from the objects to the relations. So by mapping, we generate new objects. We have to keep our attention to the relations, try to describe them on a similar level as we describe the objects in them, tag them, and colour code them. (Sevaldson, interviewed by de Koning, 2020)

The process and each development opportunity constituted an area for ZIP-Analysis. The Z-point zoomed to the level of detail bounded by the opportunity; I-points considered the opportunity itself, and the P-points were viewed as potential, consistent with leverage points (Meadows, 2008, pp. 145-165). An abductive approach was taken to applying systemic relations, that is, "the complex creative challenge of coming up with both a 'thing' and its 'working principle' that are linked to the attainment of a specific value." (Dorst, 2011, p. 524) The decisions relied on lived experience, community knowledge and connections, and the goal of social harmony consistent with social bricoleurs.

The first ZIP-Analysis was done on reverse mentorship to align with organisational capacity-building in this area. (Figure 2) The Social Finance Fund micro-map explored network relationships between social purpose organisations (SPOs) and Canada's business incubators and how the ecosystem might increase investment readiness (Figure 3). The innovation economy map considers the relationship between innovation champions and BIPOC SPO leaders and provides inputs to a grant opportunity to support the development of the B4PN weekly announcement (Figure 4).

Mapping encompasses structural relations, social relations, thematic relations, and causal & flow. The causal & flow relations include causal directions, i.e., the [+] indicates change happens in the same direction, and the [–] indicates that an increase in one indicates a decrease in the other. The dotted lines around the groups indicate that these relationships are not always active and that the composition within the group changes. Two types of social relations are depicted with dotted lines: yellow for institutional and orange for action relations; grey dotted lines express an infrequent exchange that occurs between each group. It is worth noting that the mutuality incentive and simplicity resulted in no negative loops; however, these would be expected between a collection of B4PN micro-maps.

Micro-maps as design artefacts

This section presents the micro-maps, which, together with the B4PN Strategic Framework (Figure 1), constitute the design artefacts created by the evaluation project. The micro-maps present minimal barriers to interpretation, partly because they have clear (although transmutable) boundaries. Salient is the use of ZIP-analysis and the Library of Systemic Design, which Sevaldson sets out in an accessible way on the Systems Oriented Design website (2012a; 2012b). Care was also taken to apply the basic guidelines described by Meadows (2008), use direction of change symbols from causal loop diagramming (Maruyama, 1963), and acknowledge the principles of openness, purposefulness, multidimensionality, emergent properties, and counterintuitive behaviour (Gharajedaghi, 2011).

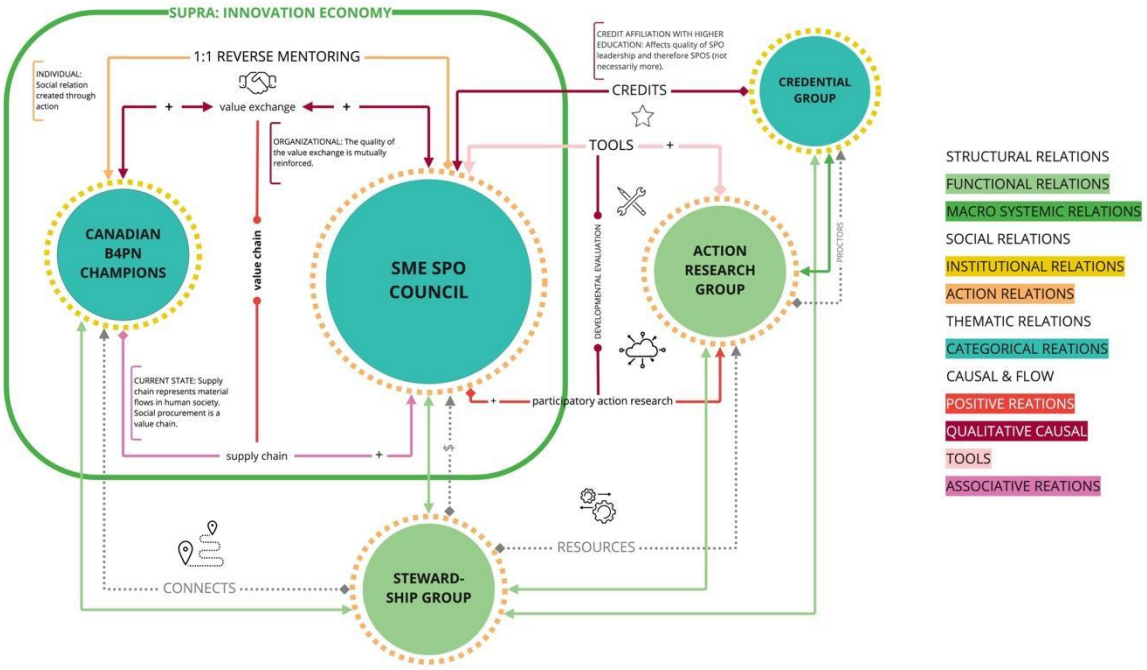


Figure 2. Reverse Mentoring & Supply Chains.

Description: The Z-point is in the strategic focus area “Business for Purpose Champions” and is situated in the innovation economy. The I-point is on the relationship between reverse mentoring and value chain innovation. The P-points are in the causal & flow relationships, which feature a two-way value exchange and one-way supply chain connections that have the potential to increase sustainable supply chain initiatives and create a value chain. The other P-point is a leverage point with credentialing groups and higher education, with affects the quality of SPO leadership and, therefore, SPOS.

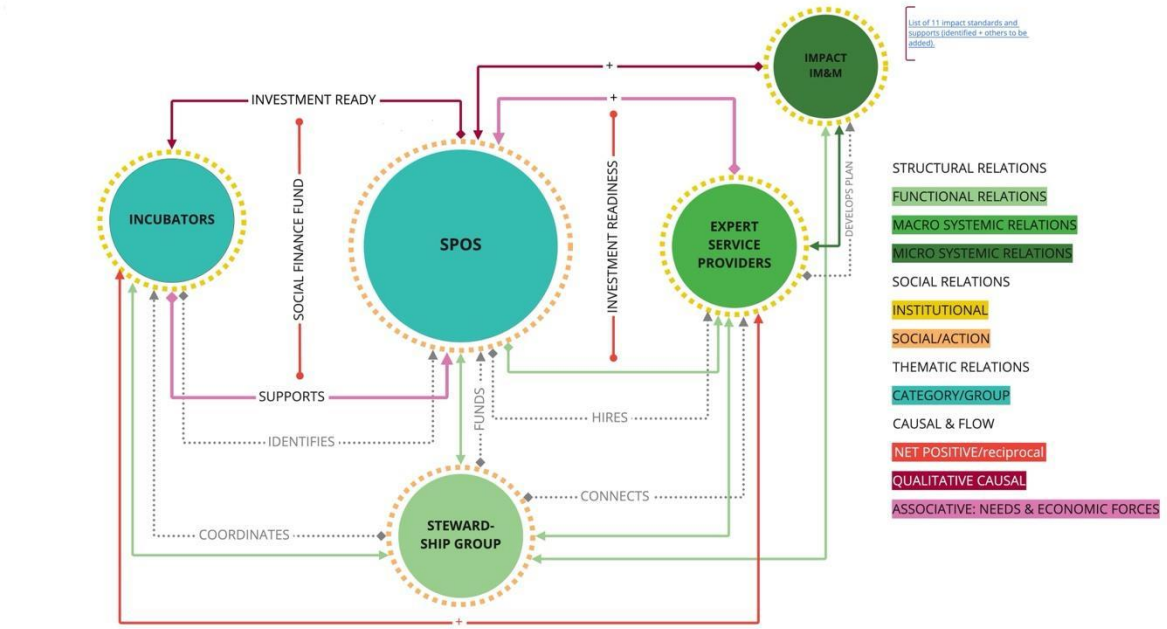


Figure 3. Social Finance Fund & Investment Readiness.

Description: The Z-point is in the strategic focus area of “Mobilising Resources” and explores the relationship between social finance and incubators. SPOs are at the centre of the map, which explores the I-points, which are the dynamics of incubators and expert service providers (consultants identified as experts in social finance). The P-points are the causal relationships (quantity and quality influenced), i.e., the number and quality of investment opportunities and Social Finance Fund deployments. The qualitative causal relations P-point is impact management and measurement, and the goal is to increase the quality of investments and the ability to evaluate the impact of investments. The flow between incubators and expert service providers results in net positive relations.

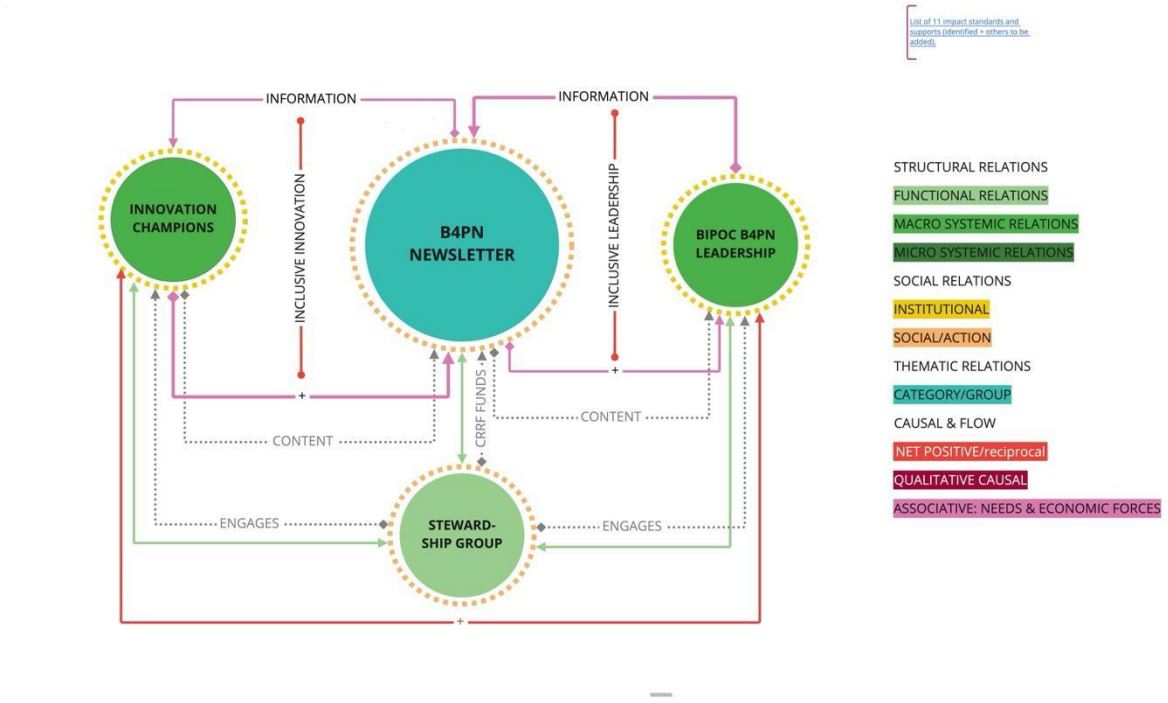


Figure 4. B4PN Weekly Announcement & Leadership Diversity, Equity & Inclusion.

Description: The Z-point is in the strategic focus area of “Social Purpose Champions” and explores information flows between innovation champions and BIPOC leadership. The I-points are inclusive innovation and leadership and the influence of associative needs – the flow of values and economic forces. The P-point is a two-way information flow and content exchange via the B4PN newsletter (or other consistent and trusted information sources), which will continually increase and act as a leverage point.

Conclusion

Although there is no single formal method for systemic design mapping, several methods are embedded in how social change designers work. Systemic design's interdisciplinary nature creates touchpoints with many fields that share similar patterns of constructing knowledge. Knowledge construction is "partly determined by the disciplinary perspective within which experts perform their research" (Boon & Van Baalen, 2019, p. 4). This project responded to the critical importance of networks and collaboration by constructing knowledge through systems thinking, design thinking, strategic foresight, social R&D, and bricolage, approaches that support a distributed group of collaborators, reduce working in isolation, and enhance the potential to solve real-world problems. Working asynchronously over time and space means leaving comprehensible artefacts behind—in this project, the signals database and relationship mapping using ZIP-Analysis and the Library of Systemic Relations—that can be interpreted and repurposed for future use across several disciplines and support the asynchronous realities of design work. A hopeful view is that the ubiquitous use of methods within the systemic design interdiscipline could act as a Rosetta stone for the design artefacts created, making it possible for someone unconnected with the original work to access it.

Quai des Arts (En Masse, 2011) is an inspirational exemplar. As a large street mural created by a group of artists over a period of time, it reinforces the idea that asynchronous work is a dynamic way to progress toward goals. Furthermore, the mural's inconsistency is part of the story; while some sections are completed to the finest detail, others are simply pencil lines expressing the outline of shapes. The *Quai des Arts* represents knowledge creation springing from a shared artistic framework and common techniques. As an analogy, the mural suggests that asynchronistic, incremental projects can support complex work, such as the ecosystem development goals of the B4PN through systemic design's interdisciplinary approach.

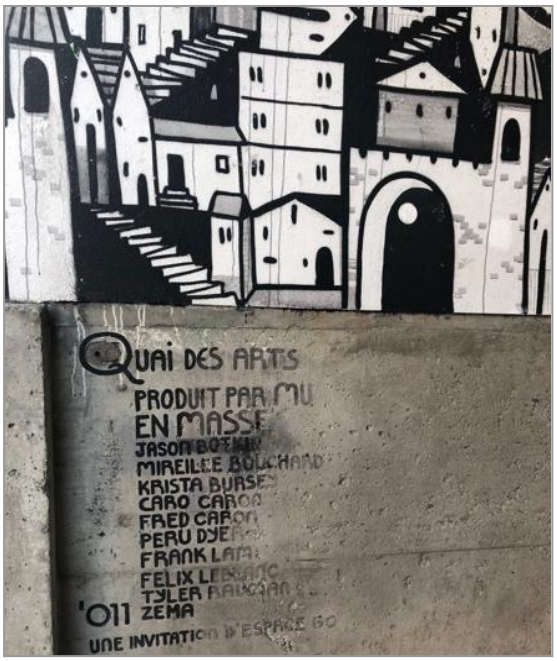
Acknowledgements

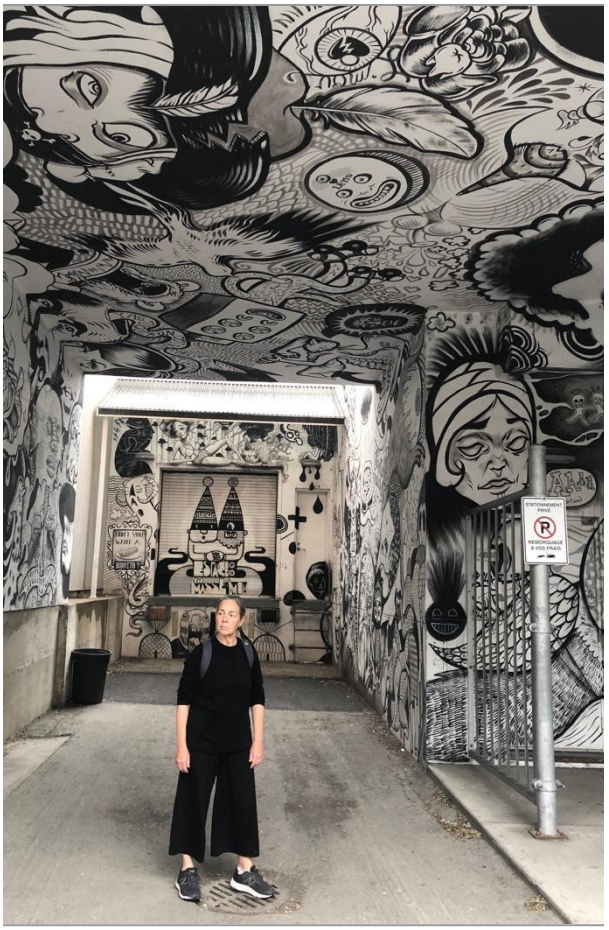
I want to acknowledge the land on which MaRS operates and where I am based. For thousands of years, it has been the traditional land of the Huron-Wendat, Seneca, and Mississaugas of the Credit. Today, this meeting place is still home to many Indigenous people from across Turtle Island, and I am grateful to have the opportunity to work on this land.

The project was funded by the McConnell Foundation, which has been steadfast in support of social innovation in Canada for over a decade. The evaluation timeframe was February to June 2022, during which time I had the privilege of collaborating with MaRS colleagues Allyson Hewitt, Marek Nakonieczny, and Josée Thibault, who share my journey of relentless incrementalism (Battle, 2001, p. 224).

The evaluation was informed by related projects that reported on sustainable procurement (Canadian Business for Social Responsibility), advancements in corporate law that could mainstream corporate purpose (David Suzuki Foundation), helping businesses get to Net Zero (Green Economy Canada), the potential of intrapreneurs (League of Intrapreneurs), and resources from the inaugural Propelling Purpose Summit, hosted by the Social Purpose Institute based at the United Way in British Columbia. Special thanks to Chryssa Koulis, Priyanka Lloyd, Serena Nguyen, Leor Rotchild, Mary Ellen Schaafsma, and Coro Strandberg, who took the time to provide subject matter expertise in interviews and emails.

Finally, thank you to the Montreal artists who created *Quai des Arts* for helping me to conceptualise how I approach my work.





EN MASSE, 2011
MONTREAL, QC, CANADA

(Visited June 2022)

Resources

1. Arnopoulos P. (1981). *The Global Problematique: System & Method for Problem-Analysis.*
2. Battle, K. (2001). Relentless Incrementalism: Deconstructing and Reconstructing Canadian Income Security. *Review of Economic Performance and Social Progress: The Longest Decade: Canada in the 1990s. Montreal: Institute for Research on Public Policy,* 183-227. https://core.ac.uk/download/pdf/7033289.pdf
3. Boon, M., & Van Baalen, S. (2019). Epistemology for interdisciplinary research–shifting philosophical paradigms of science. *European journal for philosophy of science, 9(1), 1-28*. https://doi.org/10.1007/s13194-018-0242-4
4. Churchman, C. W. (1971). *The design of inquiring systems basic concepts of systems and organisation.* Basic Books.
5. Cilliers, P. (2001). Boundaries, hierarchies and networks in complex systems. *International Journal of Innovation Management*, *5*(02), 135-147.
6. Council of Canadian Academies, 2018. *Improving Innovation Through Better Management,* Ottawa (ON): The Expert Panel on Innovation Management Education and Training, Council of Canadian Academies. https://cca-reports.ca/reports/improving-innovation-through-better-management/
7. Duymedjian, R., & Rüling, C. C. (2010). Towards a foundation of bricolage in organisation and management theory. *Organisation Studies, 31(2)*, 133-151.
8. Dodgson, J. E. (2019). Reflexivity in qualitative research. *Journal of Human Lactation*, *35*(2), 220-222.
9. Dorst, K. (2015). *Frame innovation: Create new thinking by design*. MIT press.
10. Dorst, K. (2011) The core of 'design thinking' and its application. *Design Studies, Volume 32, Issue 6,* pp. 521-532. ISSN 0142-694X https://doi.org/10.1016/j.destud.2011.07.006. (https://www.sciencedirect.com/science/article/pii/S0142694X11000603)
11. Dorst, K. (2003). The problem of design problems. *Expertise in design*, 135-147.
12. En Masse. (2011). Quai des arts [mural]. Théâtre ESPACE GO, Landing stage, Le Plateau-Mont-Royal, 4890, boulevard St-Laurent Montréal, QC, Canada. https://artpublicmontreal.ca/en/oeuvre/quai-des-arts/

13. Hargreaves, M. (2021). Bricolage: A pluralistic approach to evaluating human ecosystem initiatives. *New Directions for Evaluation*, *2021*(170), 113-124.
14. Hargreaves, M. B. (2010). Evaluating system change: A planning guide. *Cambridge, MA: Mathematica Policy Research*.
15. Harquail, C.V. (n.d.) FBMC Roadmap: Where Lean Startup Meets Feminist Business Practice. https://www.cvharquail.com/feminist-business-model-canvas-roadmap
16. Bishop, P., & Hines, A. (2006/2015). *Thinking about the future: Guidelines for strategic foresight. Social Technologies*, Washington, DC.
17. de Koning, J. (2020). The Gigamap Interview [with Birger Sevaldson]. *Proceedings of Relating Systems Thinking and Design (RSD10) 2021 Symposium.* https://rsdsymposium.org/rsd10-gigamap-exhibition/
18. Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
19. Goulet-Langlois, M., Nichols, N., & Pearman, J. (2020). Forging the missing link: New evidence towards building capacity for a robust Social R&D ecosystem. *Toronto, ON: MITACS.* http://socialrd.org/wp-content/uploads/2020/09/Social-RD-Capacity-Building-Study-Mitacs-Final-Sept2020.pdf
20. Jones, P., & Bowes, J (2017). Rendering Systems Visible for Design: Synthesis Maps as Constructivist Design Narratives. *She Ji: The Journal of Design, Economics, and Innovation, Volume 3, Issue 3.* Pp. 229-248. ISSN 2405-8726. https://doi.org/10.1016/j.sheji.2017.12.001
21. Jones, Peter and Upward, Antony (2014) Caring for the future: The systemic design of flourishing enterprises. *Proceedings of Relating Systems Thinking and Design (RSDX) Symposium*. https://rsdsymposium.org/caring-for-the-future-the-systemic-design-of-flourishing-enterprises/
22. Jones, Peter; Van Ael, Kristel. (2022) *Design Journeys through Complex Systems: Practice Tools for Systemic Design*. BIS Publishers. Kindle Edition.
23. Kurvinen, E. (2007). *Prototyping social action*. Aalto University.
24. Levi-Strauss, C. (1966). *The savage mind.* University of Chicago Press.

25. Lindblom, C.E. (1959). The Science of "Muddling Through". *Public Administration Review, Spring, 1959, Vol. 19, No. 2*, pp. 79-88. Wiley: American Society for Public Administration. https://www.jstor.org/stable/973677
26. May, C. (2022). Canadian Business for Purpose Report. *Toronto, ON: B4PN/MaRS*. https://indd.adobe.com/view/1a2f8ec2-f93b-4d7d-b90a-51205be99402
27. Maruyama, M. (1963). The Second Cybernetics: Deviation-Amplifying Mutual Causal Processes. *American Scientist, 51(2)*, 164–179. http://www.jstor.org/stable/27838689
28. European Commission, Directorate-General for Research and Innovation, Mazzucato, M. (2018). Mission-oriented research & innovation in the European Union: a problem-solving approach to fuel innovation-led growth, Publications Office. https://data.europa.eu/doi/10.2777/360325
29. Meadows, D. H. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.
30. Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers* (Vol. 1). John Wiley & Sons.
31. Ostrom, E. (1999, March). Design principles and threats to sustainable organisations that manage commons. In *Workshop in Political Theory and Policy Analysis, W99-6. Center for the Study of Institutions, Population, and Environmental Change.* Indiana University, USA. www. Indiana.edu.
32. Rajasekaran, V. (2016). Getting to Moonshot: Inspiring R&D practices in Canada's social impact sector. *Toronto, ON: Social Innovation Generation*. http://socialrd.org/getting-to-moonshot/
33. Ranjan, M. P. (2005, February). Creating the unknowable: Designing the future in education. In *Proceedings of the 6th international conference of the European Academy of Design* (pp. 29-31).
34. Schulman, S., Rajasekaran, V., & Ryan, A. (2017). Out of the Lab and into the Frontline. *Stanford Social Innovation Review*, *16*(1), A11–A12. https://doi.org/10.48558/VBD5-R172
35. Sevaldson, B., interviewed by De Koning, J. (2020). The Gigamap Interview. In Diehl, J.C., Tromp, N. & van der Bijl-Brouwer, M. (Eds.) *Proceedings of Relating Systems Thinking and Design (RSD10) 2021 Symposium.* TU Delft. https://rsdsymposium.org/rsd10-gigamap-exhibition/

36. Sevaldson, B. (2018). Visualising complex design: The evolution of gigamaps. In *Systemic Design* (pp. 243-269). Springer, Tokyo.
37. Sevaldson, B. (2012a). Library of Systemic Relations. *Systems Oriented Design (online).* https://www.systemsorienteddesign.net/
38. Sevaldson, B. (2012b). ZIP-Analysis. *Systems Oriented Design (online).* https://www.systemsorienteddesign.net/
39. Shorten A, Smith J. (2017) Mixed methods research: expanding the evidence base. *Evidence-Based Nursing*, *20,* 74-75. https://ebn.bmj.com/content/20/3/74
40. Svihla, V., & Reeve, R. (2016). Facilitating problem framing in project-based learning. *Interdisciplinary Journal of Problem-Based Learning*, *10*(2).
41. Weiss, A., & Woodhouse, E. (1992). Reframing incrementalism: A constructive response to the critics. *Policy Sciences, 25(3)*, 255-273.
42. Zahra, S.A., Gedajlovic, E., Neubaum, D.O., Shulman, J.M. (2009). A typology of social entrepreneurs: Motives, search processes and ethical challenges, *Journal of Business Venturing, Special Issue Ethics and Entrepreneurship 24*, 519–532. https://doi.org/10.1016/j.jbusvent.2008.04.007