Getting Started with Systems Mapping & Impact Management

DISCUSSION DOCUMENT

July 2023
impactfrontiers.org
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Acknowledgments

This project would not have been possible without the generous support of the Tipping Point Fund on Impact Investing, and substantial contributions from the investors, evaluators, and systems mapping experts that participated in the research process:

The TransCap Initiative
MIT Sustainability Initiative
Stanford Center for Social Innovation
The Omidyar Group
American Evaluation Association
IMP+ Working Group
Porticus
J O Hambro Capital Management
British International Investment
Inter-American Development Bank
Big Society Capital
Japan Social Innovation and Investment Foundation
Executive Summary

Growing numbers of investors are exploring ways to integrate systems thinking into their impact management practices. This discussion document explores potential ways investors can use systems mapping techniques to do so. At the time of writing, few real-world examples of systems mapping by impact investors exist. This discussion document therefore reviews basics of systems mapping techniques, and explores how they might be applied in the future at the investment and portfolio levels. Its aim is to help investors get started with this promising practice - and perhaps even share their work, creating a repertoire of models for others to follow in the future.

Systems mapping broadly refers to the process of constructing a visual model of a system. At a minimum, these models include the system's elements, the causal relationships between them, and an implicit or explicit system boundary.

Different systems mapping approaches produce different kinds of maps, which can be arranged along a spectrum from qualitative to quantitative. Qualitative system maps are typically built to analyze a system’s structure and identify possible leverage points, rather than for predictive analyses, and are therefore comparatively less sensitive to imperfect and/or incomplete information. More quantitative system maps are built to consider or predict how elements may change over time, and are therefore comparatively more sensitive to imperfect and/or incomplete information.

Investors can use different kinds of system maps to inform decision-making at the investment and portfolio levels. At the investment level, investors can use semi-quantitative system maps to assess external, unexpected impact, and evidence risks for prospective investments. These risks are often relegated to the margins of theories of change that describe a linear causal pathway between an organization’s activities and their impact goals. Investment-level systems mapping can recast the process of developing a theory of change as a structured examination of impact risk rather than an exercise in articulating an investor’s intentions.

At the portfolio level, investors can use qualitative system maps to consider where their resources may have more or less leverage over their impact goals. Investment- and portfolio-level systems mapping can then become mutually reinforcing processes, in which investors use portfolio-level systems maps to guide overall fund strategy, pipeline sourcing, and screening; use investment-level system maps to evaluate prospective deals during due diligence; and in turn use the results of their investment-level system maps to update and refine their portfolio-level system maps.

At both levels, investors can assess the strength of the evidence base for their system maps in terms of the diversity of stakeholder perspectives that they have engaged and incorporated. Robert
Ricigliano, Systems and Complexity Coach at The Omidyar Group, refers to this as the “multiple biases” principle: though a system map built from one individual or organization’s perspective may be biased, system maps get progressively less biased as they integrate a greater diversity of perspectives, each of which shines a light on a part of the system that others may not be as well-positioned to see.

Under this approach, centering stakeholder engagement in systems mapping processes can not only improve the quality and utility of the maps themselves, but may also ameliorate power imbalances between investors and their stakeholders. In this way, systems mapping underscores stakeholder engagement as both tactically and ethically desirable.
Part 1: Introduction to Systems Mapping

Just about everywhere you look there are examples of interconnected networks of nodes, whether they be causal factors, people, organisms, or actors. The dynamic relationships between these define everything from how ecosystems function to political, social and financial networks...If we are ever to be able to constructively manage these systems, we first need to be able to define their state and this involves a process of systems mapping.

Professor Sir Ian Boyd FRS

1. What is Systems Mapping?

One of the first challenges that investors interested in systems mapping often encounter is abstract definitions. These abstract definitions reflect the fact that systems mapping is an umbrella term, which groups together diverse practices.

Broadly, however, systems mapping refers to the process of constructing a visual model of a system. These visual models, or maps, are made up of the elements of the system that are relevant for a particular purpose, and the causal relationships between those elements. These abstract concepts - systems, elements, and causal relationships - can manifest in different ways in different contexts.

Systems

While there are some differences of opinion, systems mapping practitioners generally agree that elements and linkages, along with boundaries, are the defining features of a system. See for instance “Systems concepts in action: A practitioner’s toolkit”:

Systems are made up of some set of elements; systems also constitute the links between elements, whether they are processes or interrelationships; and systems have some boundary, which is central to their definition.

Beyond these parameters, there are few formal rules about what can and cannot be viewed as a system. In a systems mapping context, it is helpful to think about systems less in terms of specific definitions that separate ‘systems’ from ‘non-systems’, and more as a way of thinking about something. A household can be viewed as a system; an organization can be viewed as a system; forms of government can be viewed as systems; local economies can be viewed as systems. In each case, naming the subject under consideration as a ‘system’ implies that the subject will be analyzed in terms of its component parts, or elements, and how they interact with and affect one another.

Elements

Different approaches to systems mapping allow for differing levels of flexibility around what can be considered an element of a system. In general, elements (sometimes referred to as ‘nodes’) are dynamic nouns that interact with or affect one another within a given system.

There are many different types of elements: physical (e.g., infrastructure) and non-physical (e.g., beliefs), animate (e.g., an individual or collective behavior) and inanimate (e.g., level of GHGs). In some systems mapping approaches, elements are defined more narrowly as variables (i.e., they can increase or decrease); in others, all of the elements in the systems map are defined in terms of one or a specified set of element types (e.g., individual people’s behavior, individual organizations’ activities, the collective behavior of a group of organizations).

Each element in a systems map must be connected to at least one other element. In other words, each element in the map must either affect, or be affected by, at least one other element in the system. This rule is important to keep in mind when defining the elements in a system map.

Causal Relationships

In system maps, elements are connected to one another by lines (sometimes referred to as ‘edges’) that, at a minimum, indicate which elements directly affect others. These lines are almost always ‘directed’: they are often represented by one-directional arrows, to indicate that the element at the base of the arrow affects the element at the tip of the arrow.

The connections between elements can also communicate information about the causal relationship between two elements, such as:

- Whether a connection is ‘positive’ (i.e., an increase or improvement in the base element causes an increase or improvement in the tip element and vice versa) or ‘negative’ (i.e., an increase or improvement in the base element causes a decrease or decline in the tip element and vice versa)
- Whether a connection operates over a shorter time horizon (i.e., a change in the base element immediately affects the tip element) or a longer time horizon (i.e., a change in the base element only affects the tip element after a certain number of years)
- The strength of the base element’s effect on the tip element (i.e., a change in one base element causes a large change in a tip element, where a change in another base element causes a small change in the same tip element)
- The likelihood that a base element will affect a given tip element (i.e., it is very likely that a change in one base element affects a tip element, where it is only somewhat likely that a change in another base element affects the same tip element)
The kinds of information that are built into the causal relationships in a systems map have implications both for how the map is built and how it is used. Data availability often influences practitioners’ choices about which systems mapping approach to take, how to define a system and its elements, and for what purposes the resulting system map can be used. A helpful way of framing these considerations is to locate different kinds of system maps on a spectrum from qualitative to quantitative.

2. Approaches to Systems Mapping: The Qualitative-Quantitative Spectrum

Approaches to systems mapping can be roughly grouped into three buckets based on the kind of system map they produce: qualitative, semi-quantitative, and quantitative maps.

**Qualitative Systems Maps**

A qualitative systems map does not assign quantitative values to either the elements or the causal relationships in the map. In other words, a qualitative system map does not differentiate between the relative strength or likelihood of the causal relationships in the map, nor does it assign ‘state values’ to the elements in the map that change over time according to the causal relationships in the map. Qualitative systems maps often specify whether a causal relationship is positive or negative, and may specify whether a causal relationship operates over a shorter or longer time horizon, but does not assign quantitative values to those time horizons (e.g., immediate vs. one year vs. five years).

The absence of quantitative values in qualitative systems maps means they are not used to make forward-looking predictions about how elements will change over time.
An advantage of qualitative over quantitative systems maps is that there tend to be fewer requirements for the kinds of information that can be used to build them. Practitioners often use qualitative systems maps to aggregate and organize information drawn from disparate sources - including stakeholder engagements, market research, and practitioner experience, among others - into a visually intuitive diagram. This diagram can then facilitate dialogue between, and help build alignment among, an organization’s internal and/or external stakeholders about the elements that participate in a particular system, and how they affect one another.

However, the comparatively looser data requirements for qualitative systems maps can result in greater risks of source biases. Practitioners view qualitative systems maps as reflections of the perspectives of the sources that contributed to them, rather than as objective descriptions of a system.

Qualitative systems maps can also be used to analyze the structure of a system, especially in cases where practitioners are working with limited access to empirical data and/or with particularly large,
complex systems. Under such conditions, practitioners can use qualitative systems maps to identify possible leverage points in a system - that is, elements or groups of elements in the system that may have an outsized effect on other parts of the system. To identify possible leverage points, practitioners often conduct connectivity analyses and look for feedback loops.

**CONNECTIVITY ANALYSES**

Connectivity analyses identify the elements that affect the greatest number of other elements in the system. This can be done by simply comparing the number of primary outbound connections (i.e., outbound arrows) each element has, or by comparing the number of primary and secondary outbound connections each element has. Elements with high connectivity may have particularly large and/or wide-reaching effects on other parts of the system.

When interpreting the results of connectivity analyses, it is important to keep in mind that qualitative systems maps are not predictive tools. Whether or not an element with high connectivity in fact functions as a leverage point depends on factors not included in a qualitative systems map, such as the relative strength and time horizons of the causal relationships in the system. Practitioners can use connectivity analyses of qualitative systems maps not to make predictions, but rather to surface areas for further investigation.

**FEEDBACK LOOPS**

Practitioners also look for feedback loops in qualitative systems maps. These arise when an outbound arrow from an element is connected, either directly or indirectly, to an inbound arrow for the same element. Put differently, an element participates in a feedback loop if it affects itself.

A classic example of a feedback loop is the relationship between the number of prey and the number of predators in an ecosystem. An increase in the number of prey causes an increase in the number of predators, which in turn causes a decrease in the number of prey, which causes a decrease in the number of predators, which causes an increase in the number of prey, and so on. This is an example of what is called a ‘negative’ or ‘stabilizing’ feedback loop, in which an increase in one element ultimately results in a decrease in that same element, and vice versa.

By contrast, a ‘positive’ or ‘reinforcing’ feedback loop occurs when an increase in one element ultimately results in a further increase in that element, and vice versa. Climate scientists have highlighted the reinforcing feedback loop in the relationship between global temperatures and the size of the polar ice caps: an increase in global temperatures causes a decrease in the size of the polar ice caps, which reduces the amount of sunlight reflected back into the atmosphere, which causes an increase in global temperatures, and so on.

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Practitioners look for both types of feedback loops in systems. Neither is intrinsically ‘good’ or ‘bad’. Either may generate desirable or undesirable outcomes for stakeholders within a system, which organizations may want to either support or interrupt. Similarly, organizations may want to support or interrupt stabilizing feedback loops, depending on whether they mitigate desirable or undesirable stakeholder outcomes. Feedback are often important structural features of a system, and elements that participate in feedback loops can serve as leverage points.

Qualitative systems maps do not enable practitioners to predict how and to what extent feedback loops will affect elements within a system over time. As with connectivity analyses, identifying feedback loops in qualitative systems maps can help practitioners surface areas to investigate further.

**Figure 2: Features of Qualitative Systems Maps**

<table>
<thead>
<tr>
<th>Built with...</th>
<th>Include information about...</th>
<th>Used to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative Systems Maps</td>
<td>• Stakeholder engagements (e.g., stakeholders within a system, subject-experts) • Literature reviews (e.g., market research, academic and industry literature) • Internal knowledge</td>
<td>• Which elements participate in a system • Which elements directly affect each other, and how (e.g., ‘positive’ vs. ‘negative’, short- vs. long-time horizons)</td>
</tr>
</tbody>
</table>
Semi-Quantitative Systems Maps

Unlike qualitative systems maps, semi-quantitative maps assign quantitative values to the strength and/or likelihood of the causal relationships between elements.

**Figure 3:** (Left) Semi-quantitative system map of the UK Humber region bio-based economy. (Right) Semi-quantitative system map of deforestation in the Brazilian Amazon.

Semi-quantitative system maps tend to draw on similar sources of information as qualitative system maps. To build a semi-quantitative system map, practitioners take the additional step of using the qualitative data from those sources to differentiate between the relative strength and/or likelihood of each causal relationship in the map. This differentiation can be categorical (as in the example on the left in Figure 3) or numerical (as in the example on the right in Figure 3). Differentiating between causal relationships in this way enables practitioners to consider how a change in one element may propagate through the system by comparing the relative strength of different causal pathways, in addition to the structural analyses used on qualitative systems maps.

The semi-predictive function of semi-quantitative systems maps comes with interpretive risks. In their book *Systems mapping: how to build and use causal models of systems*, Barbrook-Johnson and Penn note:

> There is always a temptation to over-interpret the...output [of semi-quantitative systems maps]. The analysis can seem like magic and offer a false sense of certainty, truth, and scientific rigour. The outputs of any dynamic model are sensitive to the assumptions in that model, and the dynamic analysis of a [semi-quantitative system map] built based on a participatory process is the same, but those assumptions have come from a place of (quick and dirty) consensus building and deliberation, rather than cold methodical modeling...it is vital that [predictive analysis of semi-quantitative system maps] is used in the right way (i.e. as a discussion and thinking tool rather than as a forecast of what might happen), and those being shown it understand these caveats properly.
In deciding between qualitative and semi-quantitative approaches, practitioners must weigh the importance of forward-looking analyses for their particular purpose against their confidence in the information they can collect. Semi-quantitative systems maps can serve as a structured way to conduct exploratory forward-looking analyses when practitioners need to rely on imperfect, qualitative information. The results, however, should always be considered alongside the practitioner’s confidence in the reliability of their information.

**Figure 4: Features of Qualitative vs. Semi-Quantitative Systems Maps**

<table>
<thead>
<tr>
<th></th>
<th>Built with…</th>
<th>Include information about…</th>
<th>Used to…</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Qualitative Systems Maps</strong></td>
<td>• Stakeholder engagements (e.g. stakeholders within a system, subject-experts)</td>
<td>• Which elements participate in a system</td>
<td>• Build and communicate a shared understanding of the elements that participate in a system and how they interact</td>
</tr>
<tr>
<td></td>
<td>• Literature reviews (e.g., market research, academic and industry literature)</td>
<td>• Which elements directly affect each other, and how (e.g., ‘positive’ vs. ‘negative’, short- vs. long-time horizons)</td>
<td>• Identify structurally significant features of a system (e.g., high connectivity elements, feedback loops)</td>
</tr>
<tr>
<td></td>
<td>• Internal knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Semi-Quantitative System Maps</strong></td>
<td>[Same as above]</td>
<td>[Same as above]</td>
<td>[Same as above]</td>
</tr>
<tr>
<td></td>
<td>+ The relative strength and/or likelihood of the causal relationships</td>
<td></td>
<td>+ Consider how elements may change over time</td>
</tr>
</tbody>
</table>

**Quantitative Systems Maps**

Quantitative systems maps assign quantitative values to both the causal relationships and the elements in the map. They are built to make forward-looking predictions about how elements change over time, and are subject to significantly stricter guidelines regarding what kind of information they draw on and how they are built. This discussion document will not explore quantitative systems mapping, as it is often a substantially more resource-intensive process than qualitative and semi-quantitative systems mapping, involving specialized skills and significant technical training.
Part 2: Systems Mapping for Investors

There are plenty of problems that can be resolved through satisfyingly straightforward action. But there are also many conundrums that are frustrating and intractable, despite our best efforts. These tend to be the complex, dynamic challenges that have a web of interconnected elements... Systems Practice provides a method to push beyond the immediate problems to see the underlying patterns, the ways we may leverage the system, and how we can learn and adapt as the system continues to change. It doesn’t make these challenges any less complex, but it gives us a way to embrace that complexity.

The Omidyar Group, Systems Practice

Every social problem is embedded in a network of forces that affects its scope and possible solutions... a systems map provides an additional and powerful tool for helping you craft a solution to a social problem.

Stanford GSB, Developing a Strategy for Social Change

1. Systems Mapping and Theories of Change

Impact investors are increasingly interested in systems mapping. They are often drawn to systems mapping by the recognition that stakeholder outcomes are often embedded in and influenced by complex social and economic systems, and that a more structured approach to understanding these systems can aid their efforts to improve outcomes. In this way, systems mapping is well-positioned to serve as a complement to investors' theories of change.

The term ‘theory of change’, like systems mapping, is an umbrella term that refers to the various ways that practitioners articulate the “cause-and-effect logic” by which an organization’s resources will lead to changes in stakeholder outcomes. The practice was popularized in the 1960s as a way for evaluators to investigate causes of failure in social programs. Mapping out the sequence of events that needed to occur in order for a program to achieve its intended results helped evaluators pinpoint where programs went awry.


Since then, many resources have been published to support organizations in using theories of change to develop and communicate their strategies. By forcing organizations to explicitly articulate why they believe their activities will result in their desired impacts, theories of change can reveal “where [an organization’s] thinking is fuzzy – where logic or linkages are weak – and surface biases and divergent views about how change is expected to happen,”8 which “enables all parties to better understand and strengthen the processes of change...and maximize their results.”9

In short, theories of change provide a structured way for organizations to articulate the outcomes they intend to affect with their activities, and anticipate ways to increase their likelihood of success.

Theories of change vary widely in the ways in which they are developed, the kinds and amount of information they include, and the form they ultimately take. Nevertheless, they tend to share some common features. Theories of change typically start with an organization’s activities, and then describe the domino effect of changes they anticipate those activities will set in motion, which ultimately result in the organization’s intended change(s) in stakeholder outcomes. In other words, theories of change often rely on a sequential causal logic: ‘our activities will affect [stakeholder X], which will cause [change A for stakeholder X], [change A] will lead to [change B], [change B] will lead to [change C], and [change C] will lead to our target change in outcomes.’

Figure 5: An example of the structure of a logic model. Many organizations use logic models to diagram the causal logic in their theories of change.

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Figure 6: Theory of change diagram from Springboard Opportunities

Figure 7: Theory of change diagram from Voices for Utah Children

Source: Theory of Change Examples, Annie E. Casey Foundation
This logical structure suggests the transitive property: if there is good reason to believe that the organization's activities will lead to A, A will lead to B, B will lead to C, and C will lead to the intended result, then there is good reason to believe that the organization's activities will lead to their intended result. Theories of change thus implicitly identify the named causal relationships as the primary determinants of an organization's success, which in turn become the focus of their impact measurement and management strategies.

However, experts consistently highlight the importance of considering external factors and possible unintended consequences when developing a theory of change. A sequential causal logic can make it difficult to explicitly integrate these factors into the final product.

**Theory of Change Practitioners on the Importance of External Context**

“Step 1: Situation Analysis...try to suspend all thoughts about your own services or organization and focus on the ‘problem’ itself. Consider the following questions...what are the causes of the problem? Think about: individual capacities and relationships; institutions; infrastructural systems...what are the barriers to change? What are the opportunities to overcome these barriers? Who else is working to tackle the issue? Who are the other relevant stakeholders?

Step 10: Assumptions...what’s remaining for Step 10 is to identify where your theory of change is weak, untested, or uncertain. This is worthwhile because it helps you clarify what the biggest concerns are. It is also the best way to identify your main research questions...what aspects of your project delivery are you worried about? Can you really reach the people you need to reach? ...What does the external evidence say about the links and connections in your theory of change? To what extent does the evidence support what you are saying? What could go wrong? What would be unexpected? Will your project distract people from something else important? How confident are you that your theory of change team and process has genuinely had the resources and knowledge required to develop a good theory of change?”

*Theory of Change in Ten Steps, James Noble*
“Step 4: Step Back and Reflect on the Whole Picture...in what context or external environments does our theory of change operate? What are our assumptions about that context or external environment? What external conditions would help enable our ability to achieve our outcomes? What external conditions would be hostile to our work? For example, are there individuals, groups, institutions or systems that are working in alignment or at cross-purposes to our theory of change? How might we adapt if presented with challenges from these forces?”

*Developing a Theory of Change, Part Two: Step-by-Step Guidance and Examples, Annie E. Casey Foundation*

“In our ten-plus years of supporting clients in theory of change work, we’ve found six major pitfalls that, if avoided, can help nonprofits create actionable theories of change...3. Failing to take the external context into account.”

*Six Theory of Change Pitfalls to Avoid, Matthew Forti*

“Seven Traps to Avoid When Developing and Using Program Theory...Trap 4: Ignoring Unintended Results...proper management and ethical evaluation require attention also to unintended results...unfortunately, most logic models only show intended results, and many evaluations based on program theory ignore unintended effects.”

*(42-43) Purposeful Program Theory, Funnell, Sue C., and Rogers, Patricia J.*

“Check that your chain of events is ‘complete’...a ‘complete’ chain reduces the risk that you have excluded the negative outcomes experienced by some of your stakeholders. The best way of checking for ‘completeness’ is to make sure you have covered all stakeholder groups. Outcomes for all stakeholders should be considered.”

*Principle 2: Understand what changes, Social Value International*
As a framework for identifying and/or evaluating an organization’s impact strategy, then, theories of change may omit critical information about two of the nine types of impact risk identified by the Impact Management Project and Social Value International:

- **External risk**: the probability that external factors disrupt an organization’s ability to deliver their intended impact; and
- **Unexpected impact risk**: the probability that significant unexpected positive and/or negative impact is experienced by people and the planet.

When organizations have good reason to believe that these risks are low, excluding external factors and possible unintended consequences can make their theories of change clearer and more accessible.\(^\text{10}\)

In cases where external and unexpected impact risks may be more significant, however, a sequential causal logic can paint an incomplete or even misleading picture of the way that an organization’s impact is likely to unfold, and in doing so overlook opportunities to improve the likelihood of success.\(^\text{11}\) This can lead organizations to “overestimate the scale of influence [their activities] may have, and underestimate the influence of everything else going on...[theories of change] can reinforce our innate optimism; the inherent focus on the outcomes and impacts we want can blind us to potential unintended consequences, negative impacts, and the underlying inertia in systems we care about.”\(^\text{12}\)

In a webinar hosted by the American Evaluation Association on Systems Thinking and Systems Evaluation Theory, Ralph Renger explained:

In reality, the relationship between the immediate, intermediate, and long term outcomes are likely not linear. We artificially create them as being linear. So, if we [use linear theories of change to evaluate an organization’s activities], there’s likely going to be a disconnect between the findings and reality [because] you’re only working on one small fraction of the issues. And the things that you’re working on are interconnected to a lot of other things that you’ve simply ignored.

Many programs are not designed to operate in the world in which they are embedded....\(^\text{13}\)

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10 In their checklist for theories of change, the United Kingdom’s Department for International Development prompts practitioners to consider: “are causal pathways well mapped in a diagram? I.e., conceptually clear – no congested boxes containing several inputs, outputs, outcomes or causal links all lumped together?”

11 “People generally adopt an event-based linear view of causality...the problem with this approach is that it ignores feedback processes, fails to appreciate time delays between decision and result, and is insensitive to the fact that change is often non-linear.” Treistad, B., and Varma, P. (2021) “Systems Thinking,” Harvard Business School Module Note 322-030.


These concerns are particularly salient for organizations seeking to improve stakeholder outcomes that are embedded in and influenced by complex systems. In such contexts, theories of change based on a sequential causal logic appear incongruent with the dynamic, non-linear ways that changes tend to propagate through complex systems, and risk diverting attention from external and unexpected impact risks as a result.

Systems mapping offers an alternative approach to theories of change under such circumstances – a structured way to collect, organize, and critically examine the contextual factors that sequential causal logic often marginalizes. It offers a way to integrate the dynamic environment around stakeholder outcomes into theories of change, and thereby uncover new insights and opportunities.

2. Integrating Systems Mapping into Impact Investors’ Theories of Change

Impact investors can use systems mapping techniques to build theories of change for individual investments as well as for portfolio strategies. The following sections explore ways investors might utilize systems maps in both contexts.

**Investment-level**

Impact investors can use theories of change to articulate and consider the impact they expect a prospective investment to have, and their degree of confidence in that expectation, based on the information they collect during due diligence. These theories of change can then be used to inform investment decisions and impact management strategies during the ownership period.

![Figure 8: An example of a logic model structure for an investment-level theory of change.](image)

In contrast to the sequential causal model in Figure 8 above, investors can use systems mapping techniques to:

- Take a broader view of the impact that an enterprise’s activities may have on stakeholders
- Identify non-linear causal pathways between an enterprise’s activities and stakeholder outcomes;
- Surface unexpected impact risks; and
- Incorporate these considerations into their investment decision-making and impact management strategies during ownership.
Investment-level systems mapping can also help investors identify knowledge gaps, consider whether they have sufficient contextual information to articulate a plausible theory of change connecting an investment to target stakeholder outcomes, and prioritize areas for further investigation.

In effect, systems mapping can recast the process of developing a theory of change as a structured examination of impact risk – what an investor can and cannot anticipate about how an investment will affect stakeholder outcomes with the information they have – rather than an exercise in articulating their intentions.

As an investor organizes information from prospective investees, stakeholder engagements, and market research into an investment-level system map, they can ask themselves:

1. How confident are we that we have identified enough of the elements that may affect and/or be affected by this organization’s activities to form a reasonable assessment of the impact of our investment?
2. How confident are we that we have enough evidence to reliably differentiate between the strength and/or likelihood of the causal relationships between the system elements we have identified?

The first question has implications for the extent to which the system map can serve as a reliable guide to assessing the expected impact of an investment. By definition, omission of elements that may materially affect and/or be affected by an organization’s efforts to improve target outcomes raises external and unexpected impact risks, and limits a system map’s ability to support forward-
looking analyses. In such cases, the systems mapping process serves to illuminate the degree of impact risk associated with an investment.

The second question has implications for which kind of systems map an investor can build with the information they have gathered. If the relative likelihood and/or strength of the causal relationships between the elements in a system map is unclear from the information gathered, then the mapping process will produce a qualitative system map, which does not support forward-looking analyses - like considerations of the expected impact of an investment - and therefore serves a similar purpose in highlighting external and unexpected impact risks.

If, however, an investor is confident that they have identified a sufficient proportion of the relevant elements, and have sufficient evidence to differentiate between the relative likelihood and/or strength of the causal relationships between the elements, then they can produce a semi-quantitative system map that supports forward-looking analyses. In such cases, investors should still calibrate their degree of confidence in the conclusions to the strength of their evidence base.

Investors' ability to build and interpret investment-level systems maps, then, depends on their ability to assess the strength of the evidence they've gathered. Complex systems often render 'traditional' standards of evidence impractical; Barbrook-Johnson and Penn note that, in many systems mapping practitioners' view,

> When working in a genuine complex adaptive system, it is highly unlikely we will have access to the breadth or depth of quantitative data or evidence we need to formally validate...a system map, or to validate simulation outputs [i.e., forward-looking analyses]. Even where we do have some data or evidence, it is likely to be patchy, with systematic reasons determining the areas we have data and evidence for, and those that we do not. Many of the important components in a system are social or behavioral...peoples' perceptions, tactic, and local knowledge determine what they do. Data is not generally collected on many of these things; indeed it is difficult and expensive to do so. Moreover, the amount of time needed to collect data to validate on the ground knowledge is prohibitive in contexts in which decisions need to be made with reasonable haste.

In their view, practitioners need not always hold the findings of systems mapping exercises to their usual standard of evidence:

> There are many situations in which we need to make decisions...in data-poor situations, but in which we think it is likely that system interconnections are present and likely to be important. Thus, we still want to think through system interconnections more thoroughly, even without data. The pragmatic response here is to use participatory approaches to illustrate that system effects might indeed be important and to help us both raise awareness of this and start to think things through. We are likely to make better decisions with a map like this than without, so it is still worth doing.14

In short, systems mapping elevates the value of insights that emerge from diverse stakeholder experiences when decisions need to be made in “data-poor situations.” For investors operating in such contexts, the number and diversity of stakeholder perspectives that have been engaged and integrated into a systems map can serve as one possible proxy for the strength of its evidence base.

Robert Ricigliano, Systems and Complexity Coach at The Omidyar Group, refers to this as the “multiple biases” principle. Though systems maps built from one person or organization’s perspective may be biased, systems maps become progressively less biased as they integrate different perspectives from within the system.

In the context of an investment-level system map, this principle reframes the two questions presented above as:

1. How confident are we that we have engaged a sufficiently diverse set of perspectives within this system to identify the elements that may affect and/or be affected by this investment? Relatedly, how confident are we that we are engaging the right stakeholders? How do we account for the biases and incentive structures of the stakeholders we engage?

2. To what extent do stakeholders differentiate between the relative strength and/or likelihood of the causal relationships they are affected by? How confident are we in our ability to differentiate between the strength and/or likelihood of the causal relationships that different stakeholders experience?

In reflecting on these questions, investors may identify biases in their evidence base, and decide to engage additional perspectives. In some cases, investors may decide that they are unable to obtain the evidence needed for a semi-quantitative system map, and therefore assess an investment’s impact risk as high.

As investors grow progressively more confident in the strength of their evidence base, they can use a semi-quantitative system map to:

• Assess the likelihood of an investment’s intended and unintended impacts on different stakeholders within the system, by considering the relative strength and/or likelihood of the causal pathways between the investee’s activities and stakeholder outcomes.

• Identify opportunities to mitigate external and unintended impact risks by considering whether and how their capital and non-financial engagement could interrupt and/or strengthen the causal pathways between the investee’s activities and stakeholder outcomes.
Centering stakeholder engagements in the development of semi-quantitative system maps for these purposes can also serve to move investors towards the “involve” position on the spectrum of community engagement (Figure 10). As Andrea Armeni, Shante Little, and Curt Lyon of Transform Finance note, in addition to its instrumental value for organizations’ decision-making, movement along the spectrum of community engagement creates inherent value for stakeholders:

Process matters. Process in itself, regardless of the specific outcomes of an investment, can create power where the affected stakeholders are meaningfully engaged. The lack of meaningful engagement, conversely, can further disenfranchise a community, even when the project leads to other positive outcomes like jobs or new housing units.¹⁵

In this way, investment-level systems mapping positions stakeholder engagement as both tactically necessary to make well-informed decisions, and as a valuable end in and of itself.

Figure 10: The spectrum of community engagement framework. This framework is used to assess how, and to what extent, organizations involve their stakeholders’ perspectives in decision-making.

Source: Movement Strategy

Lastly, investors may choose to distill the most salient causal pathways in their systems map into more concise, accessible theories of change that resemble a sequential causal logic. Systems mapping grounds these theories in a structured, explicit consideration of the contexts in which they operate.

**Portfolio-level**

Impact investors can also use theories of change to articulate and consider an impact strategy for a portfolio of investments. These theories of change connect an investor’s investment strategy to their impact goals, and can be used to inform where and how an investor allocates its resources to pursue those goals, as well as the impact metrics they collect across their portfolio(s) to assess progress toward them.16

A sequential causal logic at the portfolio level would be structurally similar to the investment level (Figure 11). Instead of describing the impact of an investment in a specific enterprise operating in a specific context, however, a portfolio-level sequential causal logic would describe the kinds of enterprises the investor intends to invest in, and the intended aggregate impacts of their investments in them.

**Figure 11: An example of a logic model structure for a portfolio-level theory of change.**

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16 “This version of the [Theory of Change] appears to be gaining popularity, particularly in impact investing, where ‘impact thesis’ is frequently a substituted term. Analogous to an ‘investment thesis,’ an impact thesis is typically a concise distillation of an investor’s social or environmental impact objectives and strategies...guidance from Impact Assessment in Practice, a 2015 J.P. Morgan report, explains that an impact thesis or ToC seeks to ‘unite the portfolio around a goal against which the portfolio outcomes can then be assessed and towards which the investments can be managed.” Brown, M. (2020) “Unpacking Theory of Change,” SSIR.
These aggregated impacts can implicitly or explicitly involve much broader, more abstract, and/or more complex systems than those involved in the impacts of individual investments. This can influence how, and for what purposes, investors integrate systems mapping into their portfolio-level theories of change.

Investors may find it difficult to gather enough evidence to build semi-quantitative maps for portfolio-level theories of change. As the breadth, abstraction, and/or complexity of the systems increases, the number of elements that may affect and/or be affected by an investor’s activities can grow exponentially. System boundaries can also be more challenging to identify, making it difficult for investors to assess whether they have identified a sufficient proportion of the relevant elements in a system.

Portfolio-level systems maps, however, do not necessarily need to support forward-looking analyses in order to be useful for decision-making. Qualitative system maps can be used to identify possible leverage points where investors’ resources may be best positioned to advance portfolio-level impact goals. The United Kingdom’s Government Office for Science, for example, built and conducted structural analyses of a qualitative system map to consider where policy
interventions could interrupt feedback loops that were contributing to elevated obesity rates in the United Kingdom.\textsuperscript{17}

Investors can use qualitative systems maps to inform targeted deal-sourcing strategies. To do so, investors can use conduct structural analyses on qualitative systems maps to identify potentially high-leverage elements – which may refer to industries, processes, geographies, or behaviors. Investors can then build semi-quantitative systems maps for specific deals to further investigate the relationship between these elements and their target impacts in specific contexts.

Investment-level semi-quantitative systems mapping and portfolio-level qualitative systems mapping can then become mutually supportive processes. Investors can use portfolio-level qualitative systems maps to generate impact strategy hypotheses to investigate with investment-level semi-quantitative systems maps, and in turn use the results of investment-level maps to update their portfolio-level maps. This iterative cycle would position an investor’s portfolio-level theory of change as a dynamic model that evolves over time in response to investment-level learnings.

Conclusion

Systems mapping is, at present, a frontier topic in impact management, and there are few concrete case studies for investors to reference. This discussion document aims to provide investors with possible ways of getting started. By implementing and experimenting with these techniques, investors can shed greater light on some of the outstanding questions that practitioners surfaced through the consultation process for this discussion document.

Many practitioners pointed out the tension between the deliberate, resource-intensive processes that stakeholder-centric systems mapping has traditionally called for, and the time and resource constraints that investors face when making investment decisions. Investors operating in different contexts and asset classes will likely need to optimize stakeholder-centric systems mapping processes accordingly.

Participants in a webinar presentation of this project with the American Evaluation Association's Systems in Evaluation and Social Impact Measurement Topical Interest Groups (AEA SETIG and SIMTIG) also highlighted the relevance of adaptive management, emergent learning, and developmental evaluation for investors interested in going further with systems mapping. All of these represent promising avenues for deeper exploration by investors.

Practitioners interviewed for this discussion document reflected that systems mapping offers the promise of empowering investors to better achieve their stated impact goals. At the same time, it brings humbling reminders of the limits of how much investors sometimes know about stakeholder contexts, and how difficult it can be to predict the results of investors' interventions in complex systems.

Investors may start their journey with systems mapping with the intention of turbocharging their own efficacy at generating their desired outcomes, only to realize through the process that affected stakeholders sought a different outcome entirely. Rob Ricigliano of Omidyar Network offers a concluding observation: “systems mapping changes the mapper as much as it changes the system.”

Appendix: Further Resources

Systems mapping:


Theory of Change:


Promising Future Directions:


Impact Frontiers is a peer learning and market-building collaboration, developed with and for asset managers, asset owners and industry associations. The initiative creates practical tools and peer-learning communities that support investors in building their capabilities for managing impact, and integrating impact with financial data, analysis, frameworks, and processes.

Impact Frontiers originated at Root Capital, migrated to the Impact Management Project in 2019 as a natural platform for industry collaboration, and is now continuing as an independent non-profit initiative of the Bridges group.

Learn more at [impactfrontiers.org](http://impactfrontiers.org)