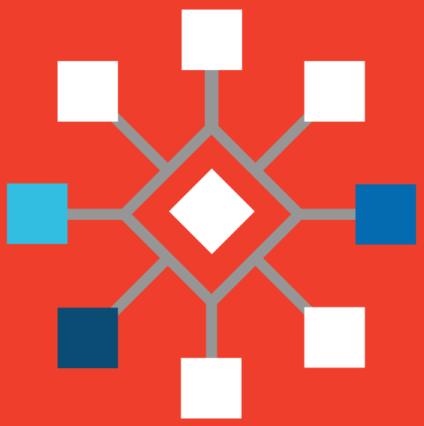
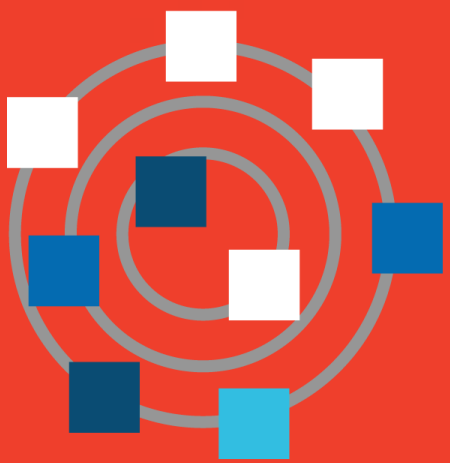
Exploring futures

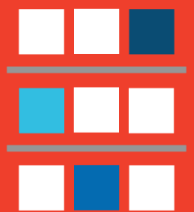
A guide to driving change, foreseeing trends









Co_Lab

UNDP Argentina accelerator lab

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UNDP acknowledges the relevance of inclusive language to make gender diversity visible. Thus, the generic masculine and female forms are alternately used in this report.

Executive summary

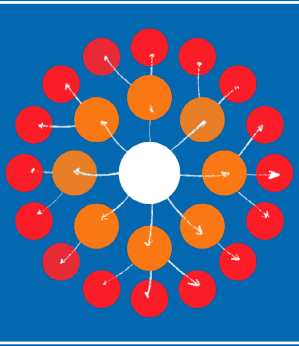
At the United Nations Development Programme (UNDP) Accelerator Lab in Argentina, Co_Lab, we seek to collaborate with people, governments, and the private sector to redefine the concept of development in the 21st century. In particular, we focus on understanding solutions and leveraging their scale. The purpose of this guide is to explore and foresee possible changes and trends in our society, learn about some of the solutions driving these changes, and build knowledge to speed up sustainable development. This document is a practical guide to exploring possible futures associated with development. It also shows the results of its implementation by introducing over 50 signals of change and concrete solutions in Argentina and Latin America. We hope that this guide will be useful for both the public and private sectors to adopt the methodology in their fields of work and learn about trends that may affect their long-term operation.

Glossary of terms

Collective intelligence: a methodology that combines individual capabilities and talents to process information, generate ideas and build solutions collectively (Peach et al., 2021).

Delphi Method: a method for groups and organizations to build consensus on complex issues. It begins with an anonymous questionnaire for specialists, based on which a report is prepared to summarize the responses obtained. The report is then forwarded to the respondents, who have the option of confirming their initial response or rephrasing it (Crawford & Wright, 2016). This method is used when multiple viewpoints are beneficial for our work or when circumstances make communication between people in a group difficult. Typical implementation scenarios include cases where experts are not in the same place, lack of consensus or time differences, and others (2016).

Exploration: It is the systematic and participatory approach used by Co_Lab to search for and identify signals of change, conducting their analysis and visualization. The process includes different methodological tools, such as horizon scanning, collective intelligence, and prospective analysis.



Futures wheel: It is a visual tool that helps us structure the process of generating ideas about direct and indirect consequences associated with a signal of change (MindTools, n.d.). It has the shape of a radial tree, with the signal of change under analysis at the center. The direct consequences arising from the signal of change are placed in the first level of nodes, while the indirect consequences are placed in the following levels.

Horizon Scanning: It is a process to search for signals of change, particularly those in the weak and emerging signal stages. The scan aims to gather information and data on different signals of change to analyze their potential impact on our organization, society, and the environment (UNDP, 2018).

Prospective analysis (foresight): methodology to build observations about future scenarios based on analyzing signals of change (UNDP, 2018).

Signals of change: They are indicators of effects with a measurable impact that can lead to transformation in one or more sectors, including the social, environmental, economic, technological, and political environments. The indicators could be at an early stage or have developed over a certain time. Based on the work of the German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung, BMBF, n.d.), according to their time of development and impact, signals of change may be classified as follows:

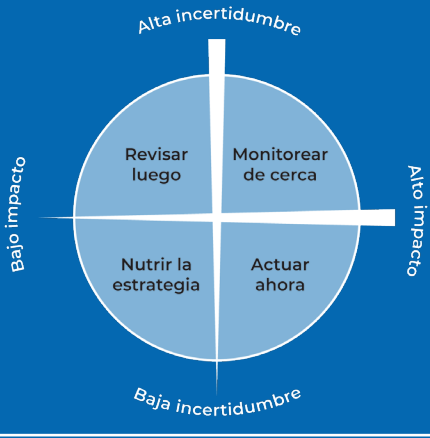
Megatrend: It is a long-term force of change with far-reaching effects, with a lifetime that spans at least 30 years. It usually displays visible indicators of its existence in several daily life environments like politics, economy, consumption, science, etc.

Trend: It is a signal of change that has been observed for a considerable time but less than the case of a megatrend (e.g., 10 to 20 years). It is characterized by a sustained development over time (like a megatrend) and has visible indicators that can be measured and described over several societal environments.

Emerging phenomenon: It is an indicator of a problem or opportunity that reflects a possible change that may become a trend in the future. To be considered an emerging phenomenon, it must have a novel value and a potential relevance that is still uncertain.

Niche phenomenon: It is a relevant indicator known to a specialized group or sector of society, such as a specific academic sector. In other words, they are usually visible in some environments, but only to a small group of people or community. It is still uncertain whether the phenomenon will remain in this small group or expand to other environments and a broader range of people.

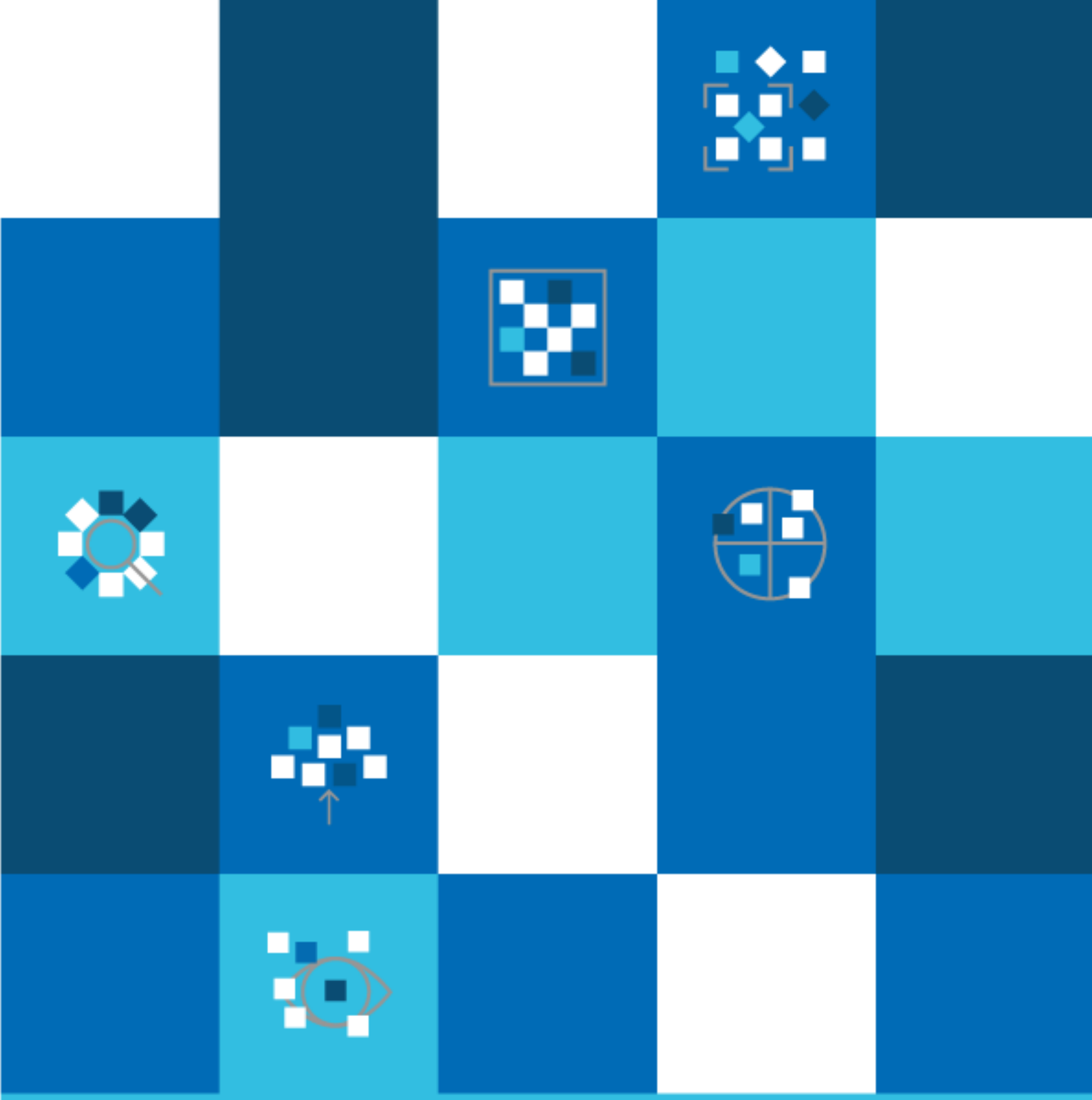
Weak signal: It is an early indicator of events with possible impact. It can occur in both external and internal areas of an organization. Their weak state implies that they are usually characterized as incomplete indicators. This means that it is hard to assess their potential effects accurately.



Uncertainty and impact matrix: It is a matrix whose ordinate (vertical axis commonly called "y-axis") represents the degree of uncertainty we have about the future characteristics and consequences of a signal of change. The abscissa (horizontal axis commonly called "x-axis") indicates the degree of impact of the signal of change. Four quadrants are obtained from the interaction of both axes, representing four basic measures that can be taken from a signal of change: Act Now, Monitor Closely, Review Later, and

Feed the Strategy (Future Today Institute, 2019).

VUCA: It is an acronym that indicates "volatile, uncertain, complex and ambiguous" scenarios (Bennett & Lemoine, 2014). It can often describe challenges associated with the current and possible future scenarios.



1. Introduction

Introduction

La capacidad de adaptarse, reaccionar y anticiparse a los cambios es un elemento fundamental para el funcionamiento y la evolución de organizaciones, colectivos de personas u otros organismos y entidades, ya sean públicas o privadas[1].

The ability to adapt, react and foresee changes is a fundamental element for organizations, groups of people, or other entities, whether public or private1. Rapid technological development, along with the consolidation of the fourth industrial revolution, social movements, and the growing effects of climate change, among others, has accelerated the changes. We are immersed in "volatile, uncertain, complex and ambiguous" (VUCA) environments (Bennett & Lemoine, 2014). In 2020, the COVID-19 pandemic deepened the creation of VUCA contexts globally, forcing organizations of all sizes and sectors to rethink their structures, dynamics, and decision-making processes to respond to the growing complexity. Undoubtedly, it is not easy to put into practice dynamic organizational responses to changing scenarios and still be able to build strategies that allow goals and objectives to be met. Hence, our goal is to share a methodology from Co_Lab that can be used to explore possible future scenarios and detect signals of change. It is an approach that can help develop strategies, inviting to challenge assumptions and review the numerous ways in which events could unfold. Thus, we offer a document to support any organization that wishes to have a proactive attitude towards change.

"Volatile, uncertain, complex and ambiguous" (VUCA) environments (Bennett & Lemoine, 2014) mean that major changes can occur unexpectedly, and for this reason, they are "volatile". They are "uncertain" because it is increasingly difficult to anticipate or predict what will happen. In addition, they are "complex" because they have a great number of interconnected elements at various levels, making it more difficult to identify the causes and possible consequences. And finally, they are "ambiguous" because the events or problems that arise cannot be reduced to a simplistic or binary classification. There is no single way to overcome such scenarios because they include nuances.

Co_Lab's working methodology consists of three phases that build a cycle. Namely, the phases are exploration, solutions mapping, and experimentation. Our first cycle was on financial inclusion. We are currently working on the second one on citizen science for environ-

[1] We believe that this guide can be useful for any organization, level of government or group of people. The word "organization" will be used to simplify the reading of this guide.

mental policymaking, understanding its potential consequences, mapping solutions, and experimenting to learn how they work and how we can scale them. We explore trends within specific signals of change in each cycle, but we can also explore trends to foresee changes and evaluate possible future work cycles and trends. In this guide, we intend to share a systematic method for detecting and showcasing signals of change, emphasizing the latter aspect of our work. Thus, the guide introduces various tools and techniques for exploring future scenarios. It allows us to delve into the prospective analysis, collective intelligence, and horizon scanning. To achieve this objective, we introduce an exploration methodology comprised of easy-to-use tools. Simultaneously, we showcase how to implement them using real examples of signals of change that we detected. The methodology proposed in this guide consists initially of a divergence stage, in which we prioritize the search for a great deal of information and data on possible future scenarios. The second stage is convergence, during which we select and analyze the most relevant signals of change for our organization. The guide also provides examples and resources to expand the knowledge about futures research beyond the proposed methodology. This means that organizations could create new methodologies or adapt the one proposed here to their particular needs.

To further study concepts of future scenarios, we suggest drawing on a wide variety of existing materials in the literature. Table 1 shows a small set of sources and resources developed by a group of organizations with extensive experience in signals of change.

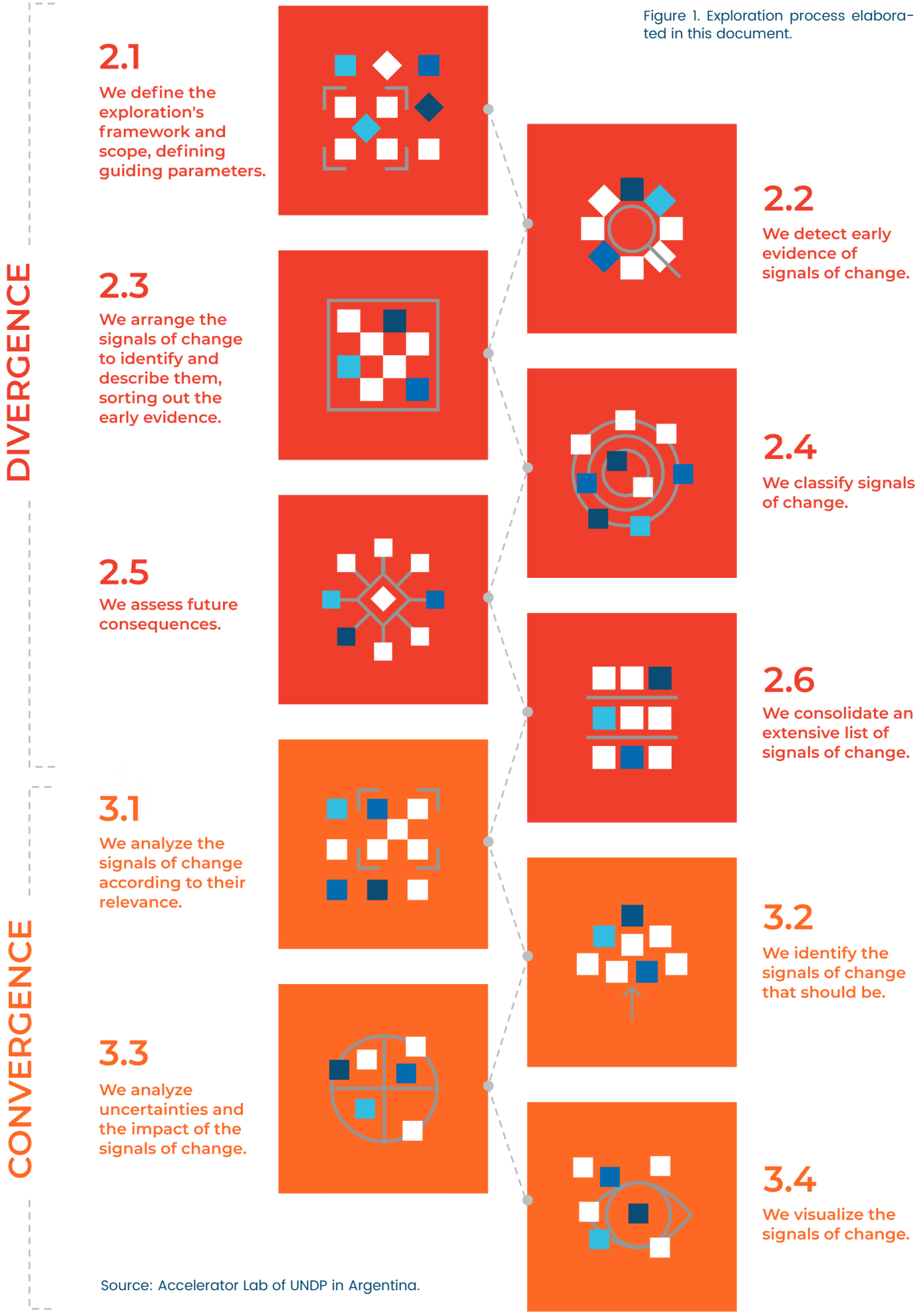
The divergence and convergence stages consist of several consecutive steps. To begin the divergence, we must define the overall exploration framework, including the future period of interest, target audience, type of signals of change, general objectives, and stages to be developed. We also introduce a strategy to enhance divergence using a digital tool called "futures wheel" (Kennedy Center, 2012), which may help identify possible unexpected signals of change. This tool is illustrated using a real example from our work cycle on citizen science for environmental public policy. We conclude the divergence with a list of identified and classified signals of change, and if desired, we also do a collective intelligence exercise to identify their potential future consequences. The convergence begins by considering the point of view of people in our organization or through meetings with external collaborators or experts. We provide a typical exercise of collective intelligence to reach a group opinion, such as the Delphi Method: (Research and Development Corporation, n.d.). To continue the convergence, we then analyze the degree of uncertainty and the potential impact of each signal of change, considering the exploration's initial objectives. Thus, for example, we identified that one of the signals of change that we address in the report, called "deepfakes as evidence", has a high degree of uncertainty and a possible high impact on the development of our society. Hence, we suggest that we must monitor the signal of change closely. Finally, we conclude the guide by indicating a way to display this type of signals of change that is useful for decision-making and achieving strategic objectives in VUCA contexts.

Table 1. Selection of manuals and resources that can be used to expand knowledge on the study of future scenarios and prospective analysis.

The Futures Toolkit – UK Government
Foresight Manual – United Nations Development Programme (UNDP)
Playbook for Strategic Foresight and Innovation – Stanford University
Future Work Skills 2020 – Institute for the Future
Anticipatory Innovation Governance – Public Sector Innovation Observatory
Strategic Foresight Primer – European Political Strategy Center
Learning from the Future – Harvard Business Review
Futures Thinking in Asia and the Pacific – Asian Development Bank
Foresight: a Glossary – Center for Strategic Futures and Civil Service College of Singapore
Alternative Futures at the Manoa School – Hawaii University
Strategic Reframing: The Oxford Scenario Planning Approach – Oxford University

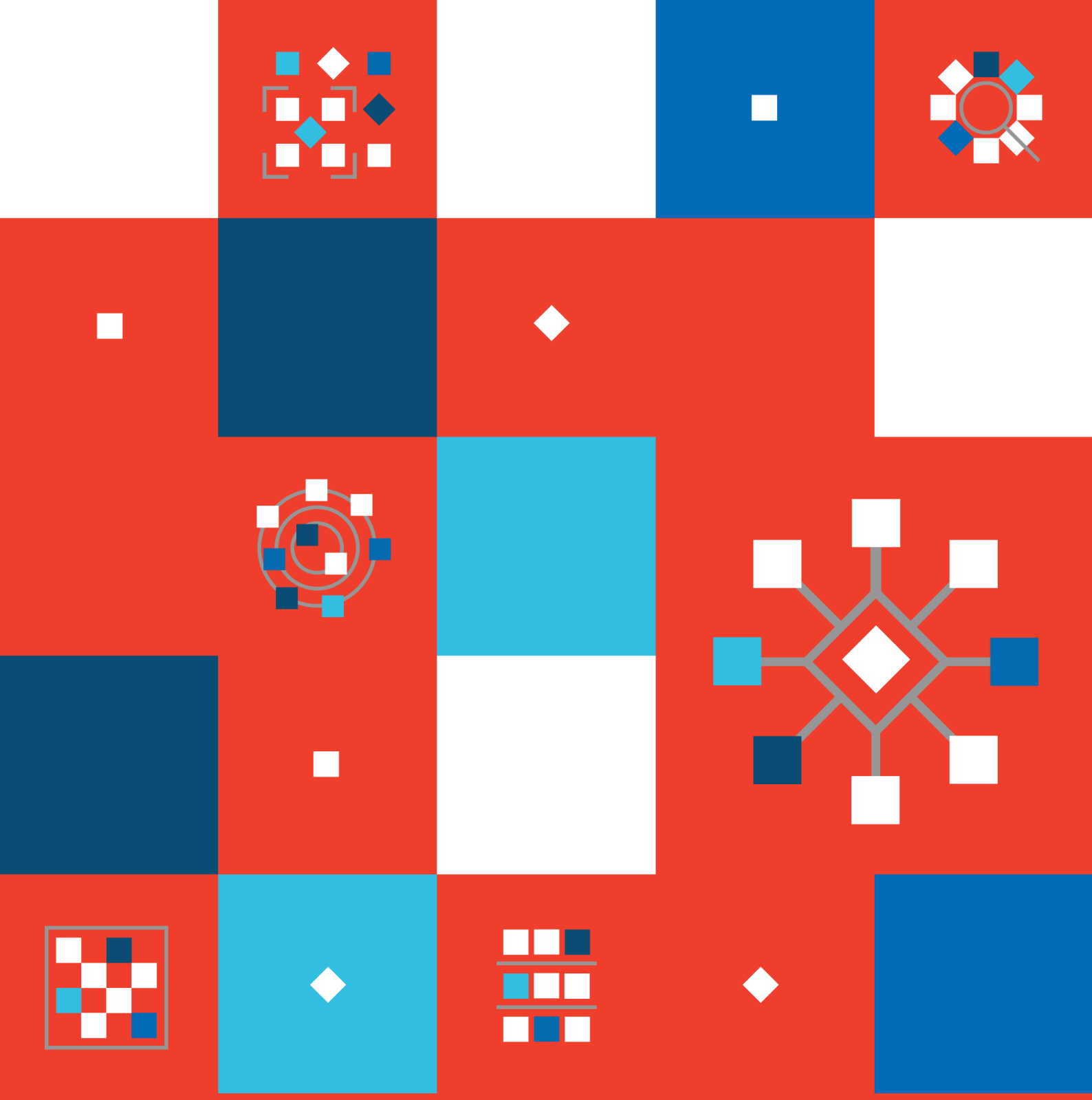
Source: Accelerator Lab of UNDP in Argentina.

Figure 1. Exploration process elaborated in this document.



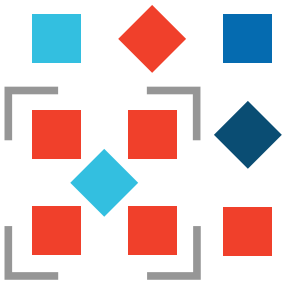
Source: Accelerator Lab of UNDP in Argentina.

As discussed earlier, we intend to show the exploration methodology alongside actual examples of our work. Co_Lab decided to conduct a broad exploration based on this guide's methodology. We set a 10-year time frame and focus on signals of change that can significantly impact Argentina and its development. The signals should allow organizations to detect opportunities or potential challenges. In particular, we focus on identifying signals of change within the social, economic, technological, environmental, and health environments. Using a wide range of data sources, which we introduce below in this guide, we focus on sorting the information and data collected, briefly describing each signal of change and displaying its sources of evidence. During the initial divergence stage, we collected 83 possible signals of change. We then reduced them to 53 signals of change during the convergence stage, and we further analyzed them. For example, we found signals of change associated with deepfakes as evidence, universal basic income in blockchain, insects as a source of protein, and sleeping disorders as a public health issue, among others. After identifying the signals of change, we focused on classifying them according to their possible temporal evolution and extent. Following the definitions provided in the glossary, we identified megatrends (e.g., sustainability or new virtual experiences), trends (e.g., antibiotic resistance), emerging phenomena (e.g., smart pollination to boost agriculture), niche phenomena (e.g., satellite images as data sources) and weak signals (e.g., "parkchipelagoes" or floating public parks).



2. Divergence

The first step in divergence is to define the framework and scope of our prospective study (Section 2.1). We shall then use various information sources, both conventional and unconventional, to find preliminary evidence about potential signals of change relevant to the objectives of the exploration (Section 2.2). As a result, we will obtain a large amount of data and information. Therefore, the next steps of divergence have to do with sorting signals of change out (Section 2.3) and classifying them according to their stage of development and impact (Section 2.4). Subsequently, we also assess their future consequences (Section 2.5). The result of this stage is creating an ordered database of signals of change (Section 2.6).



2.1 We define the exploration's framework and scope

The first step in the exploration is to define its framework and scope. This allows us to draw boundaries and establish guidelines that will prevent our prospective exercise from turning into an analysis of an infinite set of possibilities and future scenarios.

Therefore, to begin with, we must detail the parameters based on which we will define the prospective study. The following are some useful parameters to consider when carrying out this task. This is not a comprehensive list, but it can be modified according to each organization's needs, characteristics, and objectives. It is important to note that if the parameters are narrowly defined, they will reduce the effort and resources required for the study.

Time frame

Time frame: We specify the time frame to be analyzed by indicating a specific date. This is where we define whether we are interested in examining scenarios that may develop over 5, 10, or more years. We recommend choosing a time in the future that is sufficiently distant to indicate a context different from the present, but close enough to be actionable for our organization's strategy. For this reason, the most commonly used and recommended time frame is 10 to 15 years. For example, a small team of industrial designers in the city of Córdoba, Argentina, can set out to analyze the signals of change that will affect their profession in the next 10 years. Or we can think of a public sector agency interested in analyzing the signals of change that will affect public management over the next 15 years.

Target audience

Target audience: We recommend defining the prospective study's target audience in broad terms. This varies greatly according to the objectives and characteristics of the organization and usually has a broad spectrum. Still, it can also be done for a group with specific socio-demographic characteristics. In line with the previous illustrative cases, the group of industrial designers previously mentioned could be interested in identifying their work team or their closest environment, the city of Córdoba, as their target audience. On the other hand, the National Institute of Public Administration (INAP, by its Spanish acronym) can define the entire Argentine population as its target audience or restrict its selection to specific groups (public employees, senior citizens, recipients of certain social benefits, etc.), or specific geographic areas (Mar del Plata, Northwest Region, Province of Santa Cruz, etc.).

Type of signal of change

Type of signal of change: What kind of environments are we interested in addressing? We may be interested in exploring the future scenarios generated by new technology or a social issue. Our exploration may include more than one type of environment too. Following our examples, the designers may analyze signals of change associated with technology. At the same time, INAP may choose to review those linked to technology and social development or political changes.

Objective

Objective: Before starting an exploration process, it is essential to be clear about its purpose. Specifying the goal to which we hope to contribute with our exploration allows us to integrate the prospective effort into our organization or team's needs, problems, or aspirations. For example, the team of industrial designers may aim to improve their ability to respond, adapt and foresee changes resulting from the emergence of new design software. On the other hand, INAP may be interested in directing its exploration towards analyzing the impact of signals of change to improve the provision of public document processing services.

By combining the four parameters, we can generate a question that is usually relatively broad and serves as a guide for exploration. In line with the illustrative cases above, some examples of questions may include:

What are the design software developments that, within 10 years, will have the greatest impact on the industrial design sector in the city of Córdoba?

What technologies will impact processing services for Argentine citizens in 20 years?

What developments in public administration models, within 20 years, can improve the delivery of processing services for the elderly in Argentina?

In addition to defining the parameters above, we should also establish how we will carry out the exploration. In particular, we recommend defining the following:

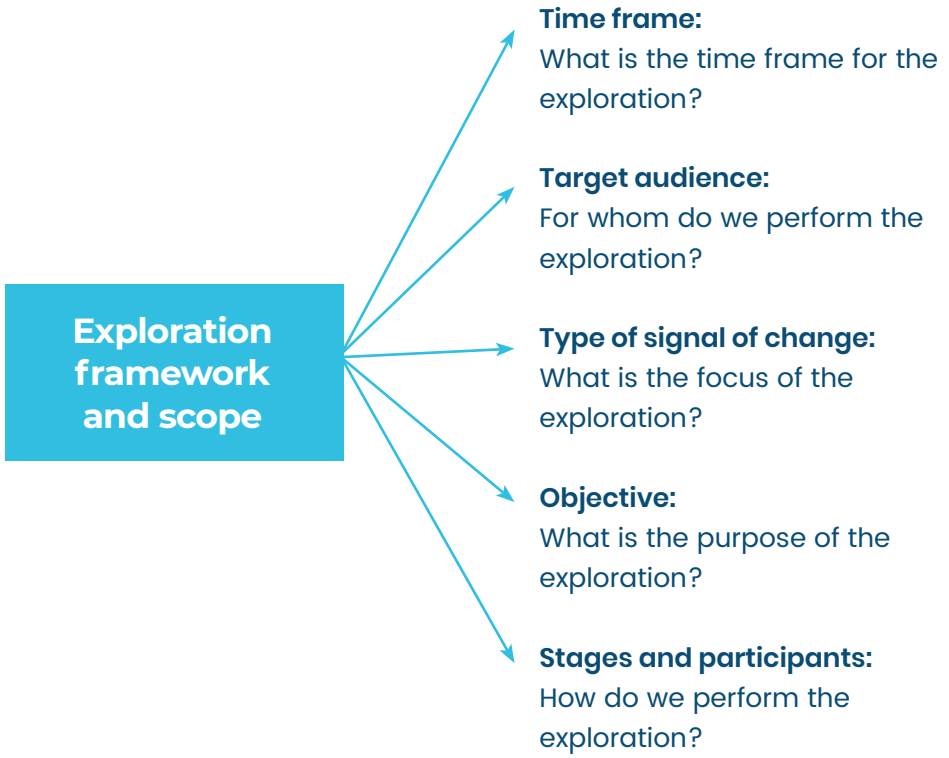
Stages

Stages: Although this guide sets out a methodology that unfolds in a series of sequential steps, it is possible to adapt the steps or include new ones according to the objectives and capabilities of our organization. It is advisable to plan the activities our exploration will include and how much time we intend to dedicate to each one. We recommend reading the entire guide to know what each step of the exploration is about and then define the steps to be taken.

People in charge

People in charge: This category defines who will conduct the exploration. We could think of participation restricted to members of our organization or with a certain degree of knowledge in a signal of change. We can also consider open participation to people outside our organization and use collective intelligence: (Peach et al., 2021). Throughout the exploration, both types of participation may be combined.

Figure 2. Parameters to consider in defining the exploration framework and scope, along with guiding questions.



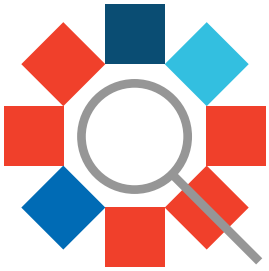
Source: Accelerator Lab of UNDP in Argentina.

Co_Lab Exploration

The following parameters were used for our exploration:

- Time frame: We set 2030 as our time horizon.
- Target audience: Argentine citizens.
- Type of signal of change: We focused on signals of change relevant to Argentina associated with health, social development, the economy, technology, and the environment.
- Objective: We wanted to be aware of emerging signals of change that could significantly impact our society and the development of Argentina.

Once we determined the exploration objectives and established the conditions for its execution, we are ready to move on to the second step of divergence.



2.2 We detect early evidence of signals of change

In this step, we aim to discover early evidence of signals of change using conventional and unconventional sources of information.

Before introducing examples of this type of source, we should elaborate on the meaning of this classification. To do so, it is useful to visualize the information life cycle using Choo's scheme adapted by Hiltunen (2008) from its original version by Wygant & Markley, 1988 (Figure 3). If we consider the research of Hiltunen, we can say that non-conventional sources are those associated with the early stages of the information life cycle. The first stage is the creation of ideas, and the second is the knowledge of elites. In other words, unconventional sources provide early information about creating an idea or knowledge that is not yet subject to mass dissemination. Along with these characteristics, we also find that, initially, only a part of the population tends to access or refer to non-conventional sources. Generally, the restricted audience is based on the signal's high degree of novelty or its specific nature, among other factors.

Thus, we can consider non-conventional sources associated, for instance, with academia. Several repositories could be useful to detect information about such signals of change, including Research Gate, Academia, Redalyc, Red de Repositorios Latinoamericanos (Latin America Network of Repositories) o el Sistema Nacional de Repositorios Digitales Sistema Nacional de Repositorios Digitales

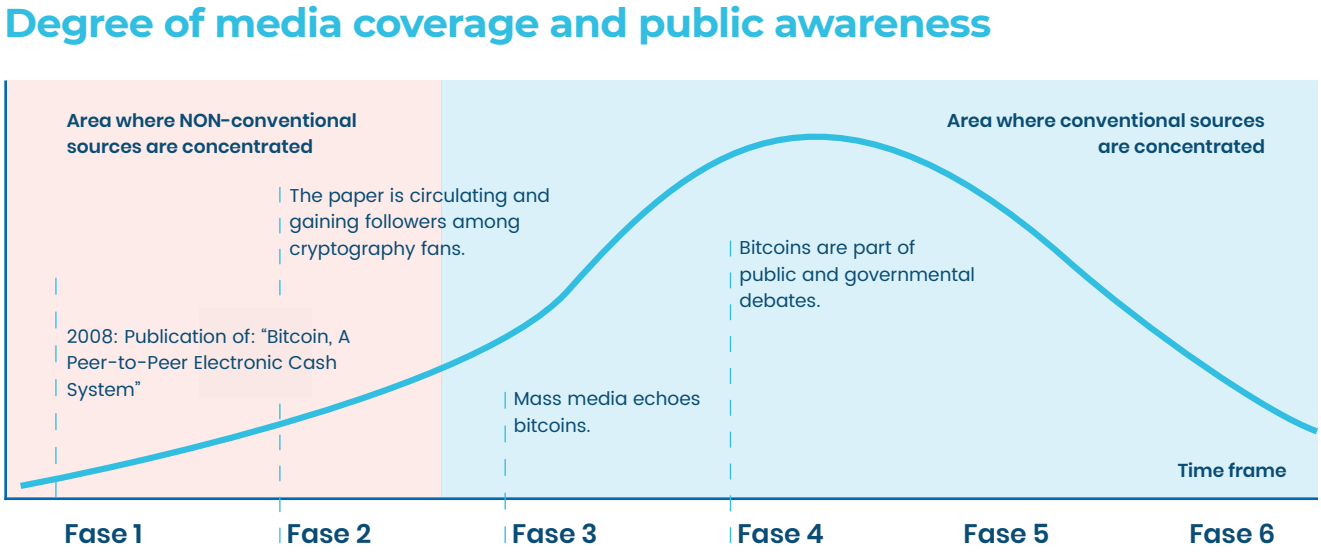
(National System of Digital Repositories) (Argentina). We can also consider other non-conventional sources such as futurists' reports, found in ranking de futuristas globales (Ranking of global futurists), or reports from global consulting firms, such as Accenture, PwC, Deloitte, Ernst & Young or KPGM. Regional organizations and initiatives that produce detailed knowledge could also be relevant. For instance, for Latin America they include the BIDLab (IDBLab), the Foro Abierto de Ciencias de América Latina y el Caribe (Latin American and Caribbean Open Science Forum) or the Red Abierta de Prospectiva e Innovación para América Latina y el Caribe (Open Network of Foresight and Innovation for Latin America and the Caribbean). If we aim to unveil early evidence of a more quantitative nature, we may use Our World in Data, Datos del Banco Mundial (World Bank Data) o Statista to name a few.

An unconventional source can be a mailing list (discussion group that runs through e-mails) that brings specialists and enthusiasts together. An illustrative example is the origin of bitcoins. By late October 2008, authored by Satoshi Nakamoto, the publication Bitcoin: A Peer-to-Peer Electronic Cash System was shared through a mailing list that brought together cryptographic enthusiasts and professionals (Redman, 2019). At the time, this became an early signal of change in blockchain technology and the decentralization of finance and was published in an unconventional source of information: a mailing list hosted on a website.

From phase three of the information life cycle, it is possible to find conventional sources characterized by wide dissemination, reaching mass audiences, and handling a friendly language to the general public. An example of such a source could be a mass-access magazine or newspaper. In line with the previous example, today, anyone could read in an Argentine newspaper an article about bitcoins and understand its content. Other interesting resources are virtual spaces to create content and debate, such as Medium, Reddit or Twitter. While massive, the user experience on these platforms tends to be structured around "bubble" communities that connect them to other people with similar interests, opinions, concerns, and views (British Broadcasting Corporation [BBC], n.d., Cable News Network [CNN], n.d.). Therefore, even within conventional sources of information such as these mass media, it is possible to find specific signals of change associated with these communities.

Capturing early evidence of signals of change is of great importance for exploration, as it serves to foresee possible future trends. As we have shown, it is possible to find information on signals of change in both conventional and non-conventional sources. However, the probability of finding early evidence of signals of change that are indeed emerging is much higher in unconventional sources, as the information has not yet become widely known. Going back to the example above, having done a prospective study between 2008 and 2010, perhaps we could have foreseen the massive growth of bitcoin in the world economy or its environmental impact (Jiang et al., 2021).

Figure 3. The information life cycle for emerging signals of change.



Phase 1
Creating the idea:
Works of art, science fiction, alternative and cutting-edge journalism, scientific journals, patent registration, doctoral dissertations.

Phase 2
Elite knowledge:
Internal newsletters, research reports from banks, analysts and forums, trade magazines, scientific and technical journals

Phase 3
Knowledge of the general public:
Radio programs, television programs, mass journalism, general interest magazines, opinion polls, fiction and non-fiction cultural content.

Phase 4
Inclusion in the public and government agenda:
Government-sponsored reports and investigations, bills, public debates, forums and hearings.

Phase 5
Systematization:
Public policy regulations, staff institutionalization and operating manuals, adoption of professional practices, integration into educational programs.

Phase 6
Documentation archiving:
Legislative records, historical records of government documents, historical analysis and studies.

Source: Adapted from Choo's scheme proposed by Hiltunen (2008).

Having reviewed the concepts of conventional and unconventional sources, let's move on to the actions required to complete our second exploration step. The first recommended action is to define the conventional and unconventional sources to draw our early evidence considering the exploration's framework and scope. Once we have selected the sources, we will work with. We need to identify keywords that describe the parameters we have defined for the exploration framework and scope (Section 2.1). We will use the keywords to search within the chosen sources and find specific material about the relevant signals of change.

One of the most effective ways to begin exploring is to identify potential signals of change relevant to our organization. This can be done by assessing horizon scanning or future studies (Featherston, 2018) done by others. It is important to consider that the horizon scanning or other future studies we use may not fall within the parameters of our exploration. However, it can be useful as a starting point. Some individuals and organizations that regularly publish

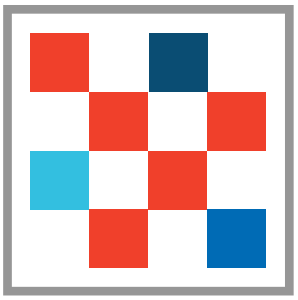
horizon scanning reports are listed in the Global Futurists Ranking or the Institute for the Future, Future Today Institute, Copenhagen Institute of Future Studies, and Kedge Futures. Other sources of inspiration for studying future scenarios can be the Global Foresight Summit, Futures Literacy Summit–UNESCO, and Foro Abierto de Ciencias de América Latina y el Caribe (Latin American and Caribbean Open Science Forum).

Discovering early evidence

We identified 83 possible signals of change along the social, environmental, economic, technological, and political environments during our exploration. In technology, for example, we discovered deepfakes as a signal of change. They refer to the creation of hyper-realistic videos by manipulating images and sounds using technologies linked to artificial intelligence, such as deep learning (Johnson, 2021). This possibility of creating fake but ultra-realistic-looking audiovisual content challenges our ability, as individuals and as a society, to judge what is real and what is not. The next step in the exploration is to sort out all the collected information.

Figure 4. We preliminary identified 84 signals of change at Co_Lab using conventional and non-conventional sources of information. Each color refers to a type of signal of change: Environment, technology, economy, social and health.

Source: Accelerator Lab of UNDP in Argentina.



2.3 We arrange the signals of change to identify and describe them

We sort the information gathered in this step by analyzing the data and information obtained. After that, we identify more detailed evidence of the possible signals of change we found.

The following categories may guide us in completing this task:

Name of the signal of change

Name of the signal of change:

What name can we give to that signal of change for which we have found early evidence?

Short description

Short description (100-250 words):

What is this signal of change about, how can we characterize it?

Trigger questions

Trigger questions (50-80 words):

To determine the relevance of the signal of change to our organization. Trigger questions provide a framework that connects the signal of change to the organization and the objectives of the exploration. They are made in question format to encompass concerns or hypotheses about possible consequences.

References or examples

References or examples:

Are there actual cases or examples that serve as visible indicators of the signal of change? The references or examples may refer to implementations of the signal of change, undertakings that carry out an activity related to the signal of change, or governmental plans, among others.

Links or references to sources

Links or references to sources:

Links or references to sources from which the information was obtained. They can be used to search for more information about the signal of change.

To order the information about the signals of change and simplify the next analysis steps, we suggest using a spreadsheet to enable quick browsing of the information. Table 2 includes a sample spreadsheet that could be followed, including the name of the signal of change, its description, field of study, references, and sources. As mentioned earlier, one of the signals of change that we identified in our exploration was deepfakes. In this section, we use this signal of change to illustrate how to describe one.

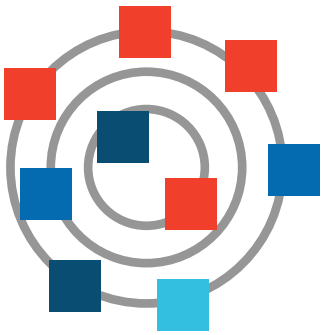
Table 2. Model to be followed for the description of signals of change.

Signal of change	Description	Trigger questions	Reference or example	Hyperlink
Name of the signal of change	Brief description	Series of questions to probe the points of contact of the signal of change with the study group and the organization.	Hyperlink to a visible indicator (reference or example) of that signal of change.	Hyperlink to information that adds value and understanding of the signal of change.

Example

Name of the signal of change	Description	Reference or example	Hyperlink to the reference or example
Deepfakes as evidence	Artificial intelligence and machine learning used for audio and video tampering. The development and evolution of social media have achieved a high level of accuracy and persuasiveness in terms of behavior modification. Furthermore, there is the emergence of deepfakes thanks to technological advances to create image, video or sound material that appears to be real but results from tampering for strategic purposes. These videos hasten the present crisis of confidence and misinformation by showing material that misleads our senses in the perception of reality, challenging our concept of what constitutes evidence. The combination results in a threat to handling information on sensitive issues, such as public health or the security of democratic institutions.	A U.S. media outlet published a video that appeared to show former U.S. President Barack Obama insulting Donald Trump. It was then revealed that the clip had been produced using emerging video editing technology. An actor's voice had been used and inserted into an original Obama clip, creating effectively a deepfake, i.e., a video of someone saying, or doing something, that did not happen. This technology, introduced as "the future of fake news," is often applied to cases involving high-profile figures because their public profiles provide lots of source material from which artificial intelligence technology can learn. However, if the amount of personal images that individuals post on their social media continues to increase, in the future, this large amount of information could also be used to generate deepfakes of "non- famous" profiles.	https://www.businessinsider.com/obama-deepfake-video-insulting-trump-2018-4

Source: Accelerator Lab of UNDP in Argentina.



2.4 We classify signals of change

Having identified the signals of change that emerged from the early evidence, we classified them based on their progress over time and scale.

The progress over time refers to the amount of time the signal of change has been developing and displaying visible indicators. On the other hand, the scale refers to the number of people or areas affected by or related to the signal of change. Considering these variables and adapting the methodology usually followed for the prospective processes by the German Federal Ministry of Education and Research (BMBF) (n.d.), the signals of change may be classified as follows:

Megratrend

Megatrend: It is a force of change sustained over time that impacts broad aspects of human life. An example of this type of signal of change can be the relocation of production. This is a megatrend that began to grow towards the end of the 1970s and has had an impact on various aspects, such as the availability of goods and services, the development of countries, how logistics networks are organized around the world, infrastructure for communications, and management models within organizations, among others.

Trend

Trend: Unlike a megatrend, a trend has been developing for a shorter time (10-20 years). For example, one trend that can be drawn from the available evidence on the dynamics involved in the relocation of production is that, over the last 20 years, global chains have tended to concentrate their places of origin and destination in three regions: North America, the European Union and East Asia (Durán Lima and Zaclicever, 2013).

Emerging phenomenon

Emerging phenomenon: It is a new challenge or opportunity that features a high degree of uncertainty regarding its characteristics and how it may evolve. It may therefore lead to a possible trend. For example, following the disruption of global production caused by events such as the US-China trade war, or the COVID-19 pandemic, an emerging phenomenon on the horizon is the quest by industries to create more resilient supply chains (Shih, 2020).

Niche phenomenon

Niche phenomenon: It is an indicator of a developing force of change affecting a small sector and is known only to a specialized social group associated with that sector. The weakening of Latin America's position in global copper production chains compared to the Asian market is an example of a niche phenomenon (Lagos et al., 2021).

Time frame

Weak signal: It is an early and inaccurate indicator of events with potential impact. Signals such as the increase in high-level economic dialogs between the US and Latin America may be early indicators of a trend toward greater productive integration between the two regions (Esposito & Psaledakis, 2021; Jacobs, 2021).

The signals of change that have been developing for a long time (e.g., 10-30 years) and are reached by many people (e.g., publicly known, with visible indicators in various environments) are megatrends or trends. They show characteristics that may enrich the exploration. Despite not presenting elements of a high degree of novelty like the other signals of change, they show development over time with visible indicators in several areas. We can discover emerging phenomena like weak or niche signals by using megatrends and trends for further analysis. This can be accomplished using the futures wheel tool described in Section 2.5.

The signals of change that have been developing for a long time but are reached only by a small group of people are niche phenomena. In addition, they add great value, as they are often innovative solutions to solve issues that have the potential to be replicated and scaled. On the other hand, signals of change that have been developing for a brief time (less than 5-10 years) and have not reached many people (not usually mentioned by mass media and with no massive awareness) are emerging phenomena.

While all signals of change are critical for exploration, emerging phenomena are often the most interesting ones because they generally present a high level of novelty yet a high degree of uncertainty. This implies that they can lead to a large impact in the future. Deepfakes are viral disinformation undercovered as evidence. They are an example of an emerging phenomenon. This emerging phenomenon occurs thanks to technological advances to create images, video, or sound material that appears real but results from tampering for strategic purposes. These videos speed up the crisis of confidence and misinformation by showing material that misleads our senses and perception of reality. In other words, they challenge our concept of what constitutes evidence. For this signal of change, as an emerging phenomenon, some visible indicators that might have been detected are the augmented reality filters on Instagram and Snapchat.

Weak signals are signals of change in an early stage and are scattered. These could become emerging phenomena in the future, so we recommend identifying them to assess their evolution. Furthermore, it sometimes happens that, during exploration, we discover that several weak signals together form a pattern that we can define as an emerging phenomenon. By including weak signals in the exploration, we do a truly divergent search that helps us investigate a larger number of signals of change.

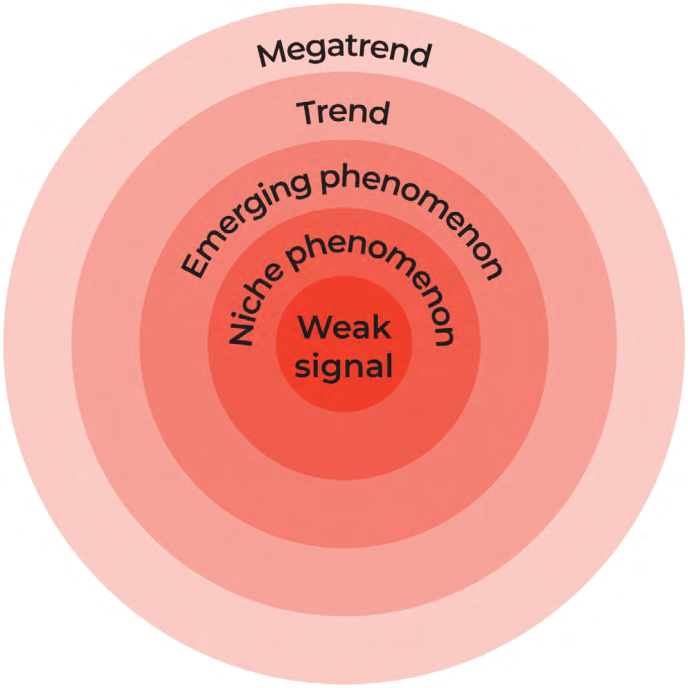
With this categorization of signals of change in mind and using the concepts explained in Figure 3, we can classify the signals of change that emerged from Section 2.2. To do so, we began by asking ourselves two questions about each of the signals of change we identified:

1. **How long has the signal of change been developing?**

2. **How many people do the signal of change influence?**

We recommend having visual support to organize the classification. Therefore, based on the answers to these two questions, we will classify the signals of change and thus locate them, as shown in Figure 5. This visual methodology is particularly important when working collaboratively among several people and with many signals of change.

Figure 5. Categorization diagram of the signals of change according to the degree of evolution and scale.



Source: Accelerator Lab of UNDP in Argentina.

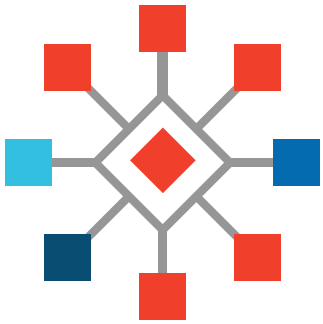
The results of this exercise may be systematized in our spreadsheet. Hence, we revisited Table 2 and added one more column in the spreadsheet to include its classification, as shown in Table 3. Below is a template that shows the signal of change related to deepfakes.

Table 3. The spreadsheet used for the analysis of signals of change will be enlarged as the exploration progresses, columns should be added to enrich the analysis.

Name of the signal of change	Description	Reference or example	Hyperlink to the reference or example	Categorization: Megatrend, trend, emerging phenomenon, niche phenomenon, weak signal
Deepfakes as evidence	Artificial intelligence and machine learning used for audio and video tampering. (...)	A U.S. media outlet published a video that appeared to show former U.S. President Barack Obama (...)	https://www.businessinsider.com/obama-deepfake-video-insulting-trump-2018-4	Emerging phenomenon

Column added to include each signal of change categorization

Source: Accelerator Lab of UNDP in Argentina.



2.5 We assess future consequences

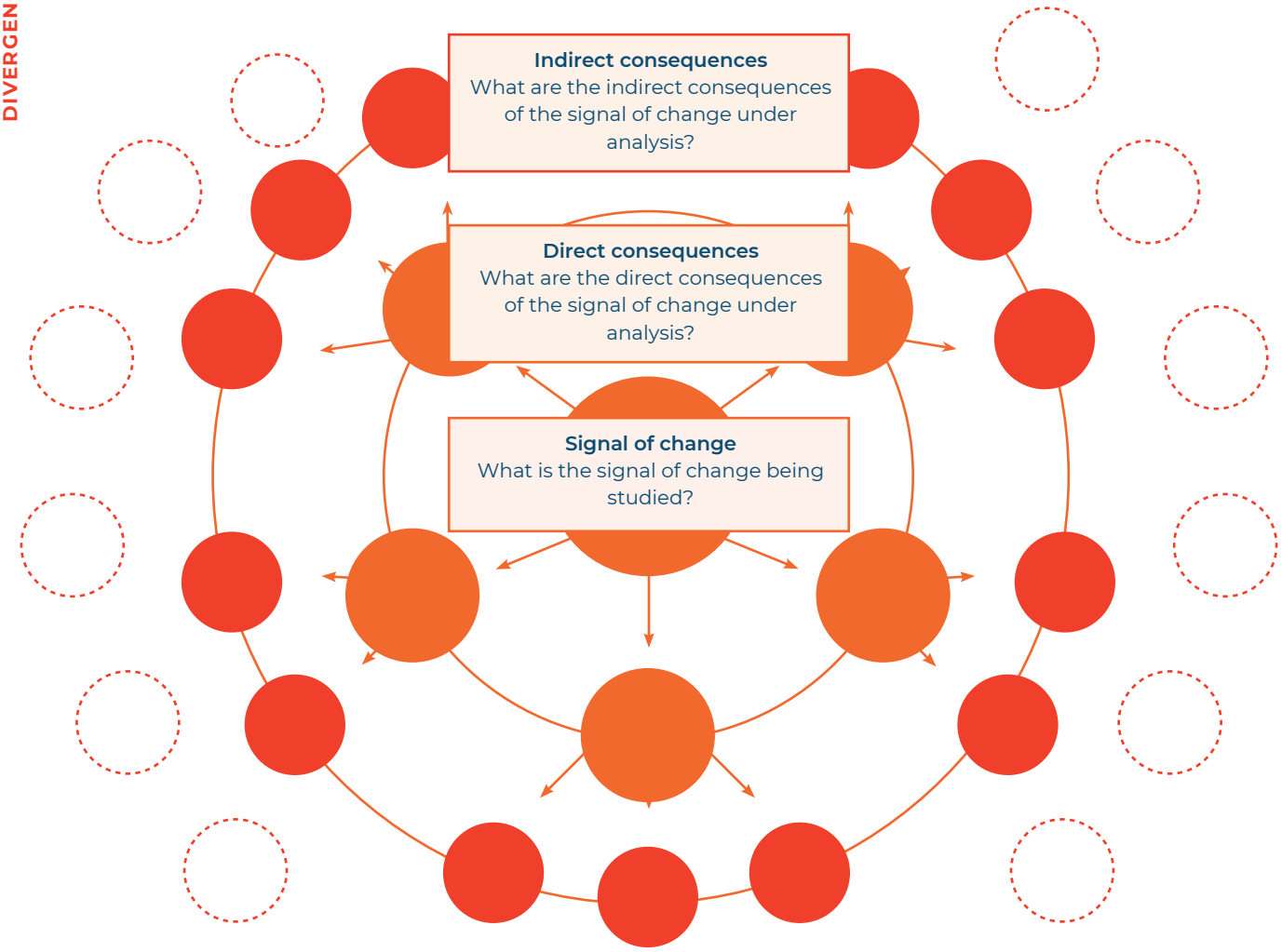
Once we have classified the signals of change, we can use megatrends and trends for a second divergence activity to identify their direct and indirect consequences. We note that such consequences may be positive or negative, and they can be expressed in various natural and social settings.

We suggest using the futures wheel (see Figure 6) for unfolding consequences from megatrends and trends. The futures wheel is a versatile tool that can have adaptations (MindTools, n.d.) that vary according to each organization's objectives. In the case of our exploration, we shall use it to discover new emerging phenomena, niche phenomena, or weak signals, using the consequences derived from megatrends or trends.

The futures wheel is a useful tool for working with groups of experts, regardless of whether or not they have prior knowledge of futures methodologies. This is because it is a simple, quick, and collaborative tool (Kennedy Center, 2012) that allows us to visualize and broaden our

view of possible unthinkable consequences. The dynamics of the tool helps to develop "future-oriented thinking". However, it should be noted that the quality and depth of the information will depend on the expertise of the people participating in the activity.

Figure 6. Futures wheel structure diagram.



Source: Accelerator Lab of UNDP in Argentina, based on Jerome C. Glenn (2009).

After including the megatrend or trend at the center of the futures wheel, we recommend completing it in stages from the center outward, progressively starting from each concentric circle. In each concentric circle, the consequences are always direct and are derived from the previous element. Up to four or five levels are usually completed, and we suggest that each level be identified with color. As we identify direct consequences in each concentric circle, we find possible indirect consequences that we may not have considered at first. Therefore, at the end of the activity with the futures wheel, the last elements identified will be indirect consequences of the megatrend or initial trend selected.

We can complete the different levels of a futures wheel freely or by following a guide that includes certain conditions, as described below:

Free-form

Free-form: We first freely select a megatrend or trend that we place at the center of the wheel and then conduct several rounds of brainstorming (collaboratively or individually), completing one level of consequence at a time.

Guided by a reference framework

Guided by a reference framework: The most commonly used framework is the so-called "social, technological, economic, environmental, and political" or simply STEEP framework (Kefalas & Schoderbek, 1973). We place the megatrend or trend at the center and include the STEEP framework environments on the wheel's first level. We then complete the rest by identifying the consequences according to the framework.

Guided by needs areas

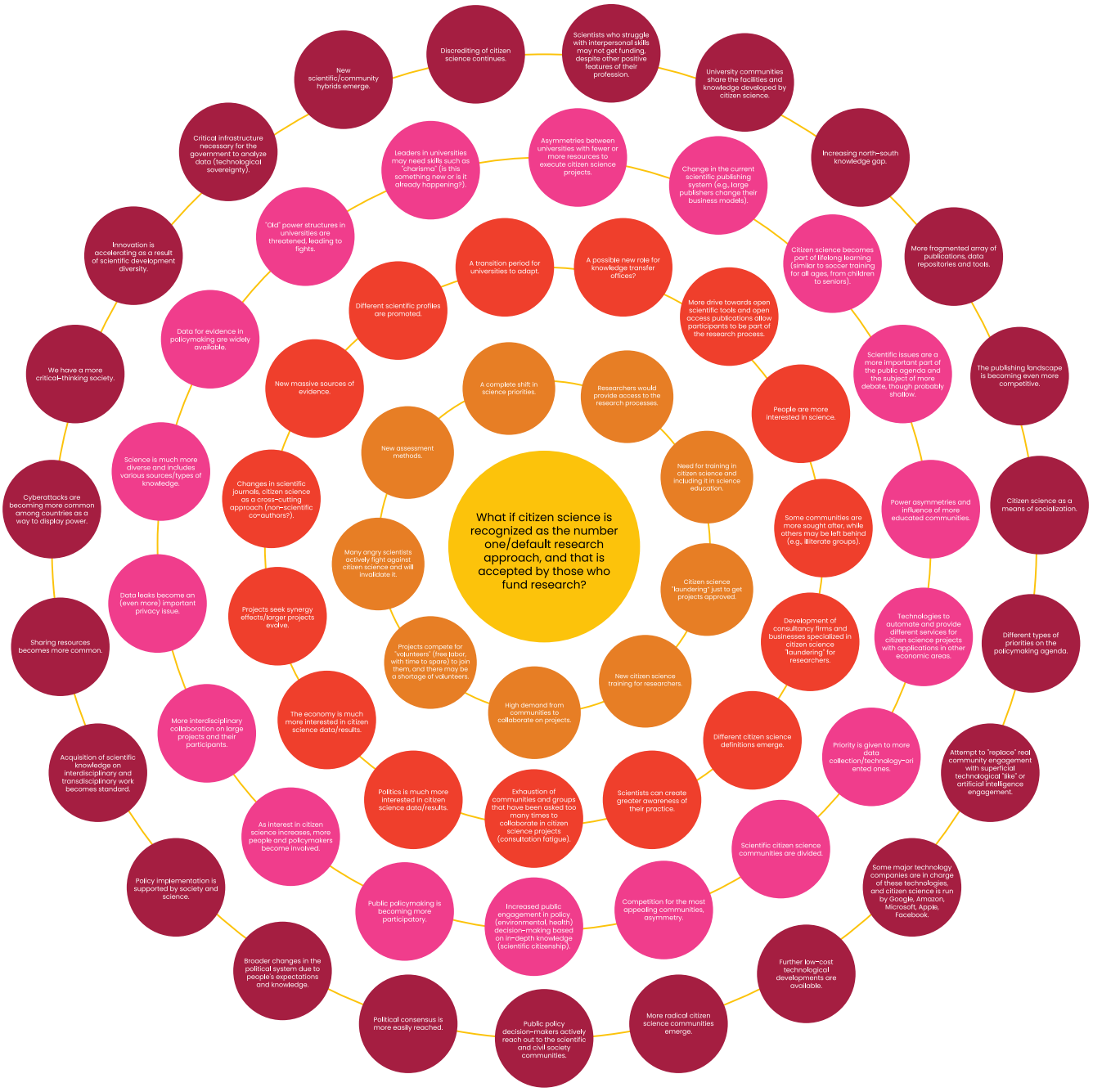
Guided by needs areas: This option replicates the process described in the STEEP framework, but rather than using these environments, we use society's needs, such as health, education, and transportation, among others. In other words, we will complete it by identifying the direct consequences of the combination of the megatrend or trend in each of the areas.

Guided by the ODS

Guided by the Sustainable Development Goals (SDGs): In this option, we place the megatrend or trend at the center, then place the selected SDGs in the first level and complete it by identifying the direct consequences of this combination. We recommend choosing a few or splitting the 17 SDGs into two separate wheels to make the activity easier.

As mentioned, the futures wheel is often used to think and visualize possible unintended consequences collectively. At Co_Lab, we carried out this activity as part of our work cycle on citizen science for environmental policymaking. We wanted to understand better possible future consequences and relationships between citizen science and public policy in Argentina. Yet, other megatrends or trends could have been used for this analysis. Figure 7 shows the results of a futures wheel exercise on citizen science conducted by UNDP Argentina with international experts.

Figure 7. Sample diagram of the free-form futures wheel showing a trend analysis.



Source: Accelerator Lab of UNDP in Argentina.

The experts who participated in the activity are listed below:

Prof. Muki Haklay. Extreme Citizen Science, ExCiteS, Department of Geography, University of London (United Kingdom).

Dra. Susanne Hecker. Head of the Society and Nature Program at the Museum of Natural Sciences - Leibniz Institute for Evolution and Biodiversity Science (Germany). Chair: European Citizen Science Association (ECSA).

Dra. Julieta Arancio. Associate Researcher at the Centro de Investigaciones para la Transformación (Research Center for Transformation, CENIT, by its Spanish acronym), Universidad Nacional de San Martín (National University of San Martín, UNSAM, by its Spanish acronym) (Argentina). Co-founder of the Latin American Network of Open Technologies for Science and Education (reGOSH). Postdoctoral researcher at Fair Tech Collective, Drexel University (USA).

Debbie Gonzalez Canada. PhD candidate at the University of Melbourne (Australia).

Once the futures wheel was completed, the experts identified opportunities and threats related to the consequences. The following are some of the threats identified:

Biases

Biases: Suppose the field of citizen science develops, and competition increases among the scientific community to get citizens involved to collaborate. A possible consequence would be to reduce the difficulty of entering into the citizen science experiments. In that case, people will choose to work with peer groups from nearby regions with a certain level of education and cultural similarity. This would facilitate people's engagement with citizen science, but it would increase biases, impact the quality of the scientific process, and thus affect the results.

Knowledge asymmetry

Knowledge asymmetry: Another possible consequence would be reinforcing the global north/south knowledge disparity due to a lack of access to resources. The lack of funding for citizen science projects in the countries of the southern hemisphere could result in fewer projects, and if they are carried out, the quality of the results may be lower due to a lack of resources.

The following are some of the opportunities identified:

Improvement of public policies

Improvement of public policies: If citizen science projects were to increase, this would be an opportunity for politicians to identify issues relevant to citizens and thus promote initiatives aligned with the concerns/interests of the communities they serve. In addition, scientific data on the implementation of government projects could be analyzed and obtained.

New scientific profiles

New scientific profiles: If citizen science becomes the main scientific methodology, many scientific career profiles will be promoted. Priority would no longer be given only to the publication of scientific papers. There would also be other considerations for career development, such as soft skills, including effective communication, empathy, and leadership.

The exercise was carried out through a digital platform that allows the development of virtual collaborative work among different participants. At Co_Lab, we developed an open-access template for anyone who wants to implement this exercise. The template includes time frames for each activity, the diagrams necessary to complete the wheel, and a short description of the steps of the activity.

2.6 We consolidate an in-depth list of signals of change

Once the second divergence activity is completed (i.e., the conclusions of the futures wheel exercise (Section 2.5) are obtained), we add the newly identified signals of change to the list and look for sources of evidence to confirm or refute them.

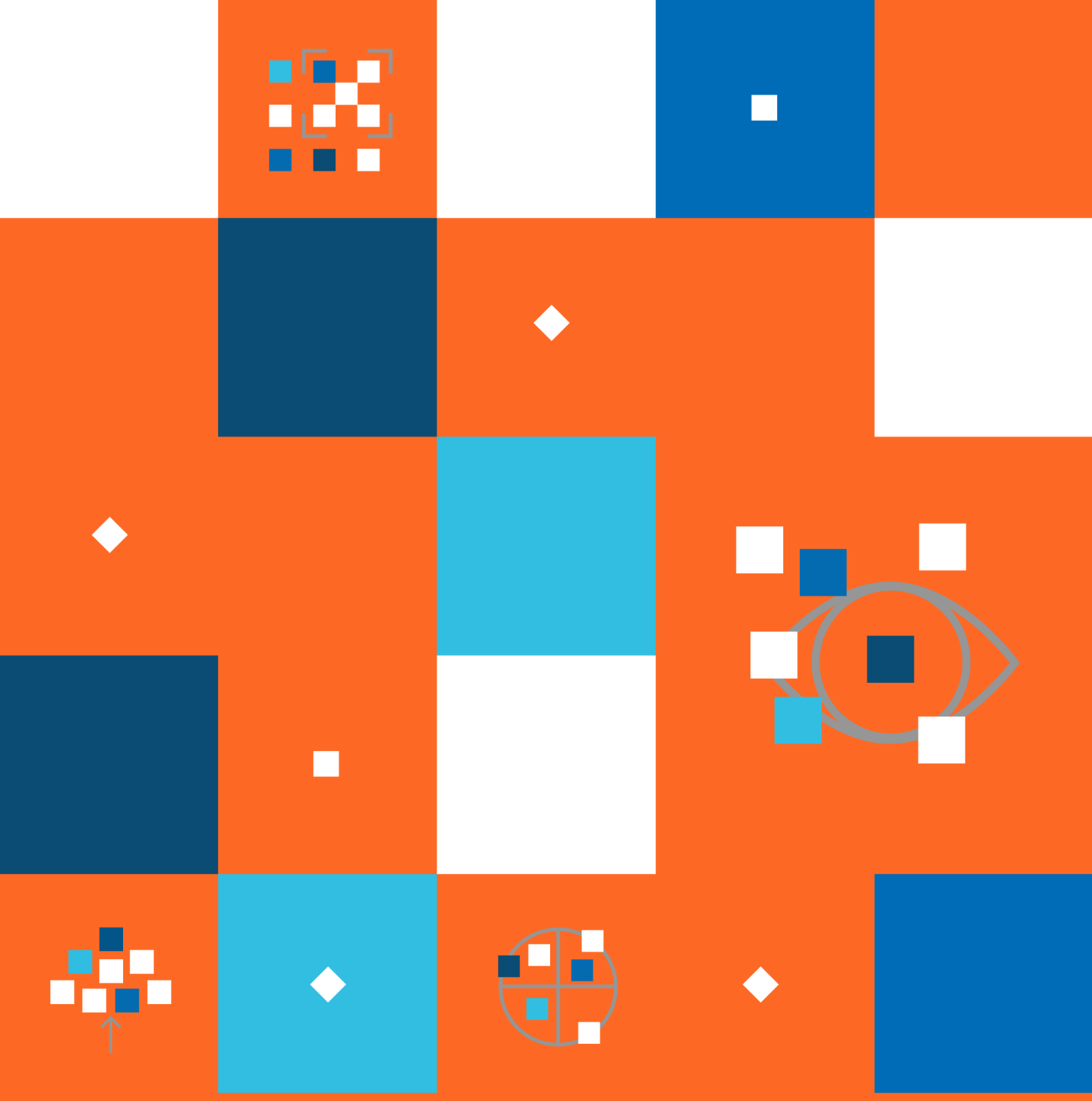
Table 4. Signals of change are added in this stage.

Signal of change	Description	Trigger questions	Reference or example	Hyperlink	Category
Name of the signal of change	Brief description	Series of questions to probe the points of contact of the signal of change with the study group and the organization.	Hyperlink to a visible indicator (reference or example) of that signal of change	Hyperlink to information that adds value and understanding of the signal of change	Megatrend, trend, emerging phenomenon, niche phenomenon, weak signal

We added new rows with the signals of change arising from the second divergence activity.

Source: Accelerator Lab of UNDP in Argentina.

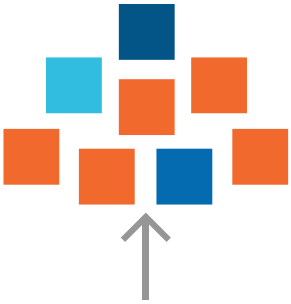
At the end of the divergence process, the result is a database with an extensive list of identified signals of change. From this point onwards, we focus on analyzing the signals of change rather than adding new ones. As a reminder, we recommend finding between 50 and 80 signals of change at this stage. This data sheet will be the working basis for the exploration convergence in Section 3.



3. Convergence

Once the divergence stage is completed, we move to the convergence stage. It allows us to analyze, filter, and visualize the signals of change.

The first step of convergence involves analyzing the signals of change in our extensive list according to their relevance to our organization (Section 3.1). Because analyzing in detail signals of change can be a time-consuming job, we aim to delve into a small number of signals of change. Therefore, considering the relevance of the signals, we filter them to proceed to a more detailed analysis in a reduced number (Section 3.2). We continue by analyzing the degree of uncertainty and impact (Section 3.3). The convergence concludes with the visualization of the information related to the signals of change (Section 3.4).



3.1 We analyze signals of change based on their relevance

In this step, we analyze the relevance of the signals of change identified in the divergence stage.

To do this, we first assess the degree of impact that the signal of change may have on our organization's daily activities and organizational structure and consider the target audience of our exploration. Next, we assign a value from 1 to 5 to that level of impact (where 1 is the lowest and 5 is the highest). For example, suppose an exploration focused on Argentine society and that we were to find a signal of change linked to the agricultural industry. In that case, this signal of change could likely be classified as highly relevant since this industry is the cornerstone of Argentina's economy. The exploration team can carry out this relevance analysis, but we can also opt for collaborative and open working methods. Workshops can be held with stakeholders relevant to the analysis, such as government officials, civil society, or students. This is usually done to understand their point of view on the particular signals of change and thus define or enrich their assessment. In these workshops and meetings with external participants or experts, collective intelligence exercises can be implemented, such as the Delphi Method or an adapted method that we developed for virtual implementation. Below, in the "Collective Intelligence" section, we provide these

types of methodologies along with references so that anyone interested can further expand their knowledge on the topic. In this way, we can include the results of the relevance analysis in the working spreadsheet. We suggest adding the results in two columns to be completed with a number to facilitate further analysis, as shown in Table 5.

Table 5. Columns for the relevance analysis.

Signal of change	Description	Trigger questions	Reference or example	Hyperlink	Category	Relevance for the organization	Relevance for the public
Name of the signal of change	Brief description	Series of questions to probe the points of contact of the signal of change with the study group and the organization.	Hyperlink to a visible indicator (reference or example) of that signal of change	Hyperlink to information that adds value and understanding of the signal of change	Megatrend, trend, emerging phenomenon, niche phenomenon, weak signal	Value from 1 to 5	Value from 1 to 5

We added two columns to include numbers that indicate relevance for the public and the organization.

Source: Accelerator Lab of UNDP in Argentina.

Collective intelligence

Collective intelligence is a type of shared intelligence generated from the collaboration of various stakeholders. The collective intelligence methodologies (Mattingly, 2014) offer a variety of perspectives and enrich the exploration. The Delphi Method (Research and Development Corporation, n.d.) is an extremely useful tool for collective intelligence processes that seek to reach a group decision or consensus. It is usually used to engage people with particular knowledge, like experts in a field or people affected by a local issue. It is implemented using successive rounds of questionnaires (n.d.) until the group reaches a consensus.

At Co_Lab, we used a collective intelligence exercise similar to the Delphi Method. All the UNDP Argentina Office staff participated in the exercise, which, in turn, is useful to the prospective analysis within our organization. To this end, we created a visualization of the signals of change and a virtual workspace that served as a model, or template, to visually guide participants through the steps of the proposed collective exercise. The first part of the collective exercise focused on assigning the signals of change selected by the Co_Lab to the relevant SDGs. As a result, for example, the deepfake signal, already mentioned in this guide, was associated with SDG 4 (Quality Education) and 16 (Peace, Justice, and Strong Institutions). The second part consisted of assigning the signals of change a relevance value from 1 to 5 (where 1 is the lowest and 5 is the highest value). This value had to be assigned based on the priority that the signals of change have for the development of Argentina. Finally, there was a debate on the threats and opportunities that come with the signals of change identified at Co_Lab. Still using the example of the deepfakes, it was emphasized that the immediacy with which they act poses a risk to confidence and public systems. At the same time, the group also stressed that this new technological development could increase connectivity levels, generate new expressions of creativity, and foster new sources of employment. Nevertheless, the need to work towards the democratization of these new technologies and the simultaneous development of high IT security standards was noted. The results of this exercise led us to review and fine-tune some of the information we had previously worked on the signals of change that we identified.

3.2 We identify the signals of change that should be prioritized

Once the analysis of the signals of change from Section 3.1 is completed, we can add this information to our spreadsheet and select the most relevant signals of change

We suggest having a balanced distribution of different types of signals of change for subsequent analysis. We aim to identify and prioritize those with a high novelty and a high potential impact on our organization.

3.3 We analyze uncertainties and the impact of signals of change

At this stage, we analyze the selected signals of change using the uncertainty and impact matrix (see Figure 6).

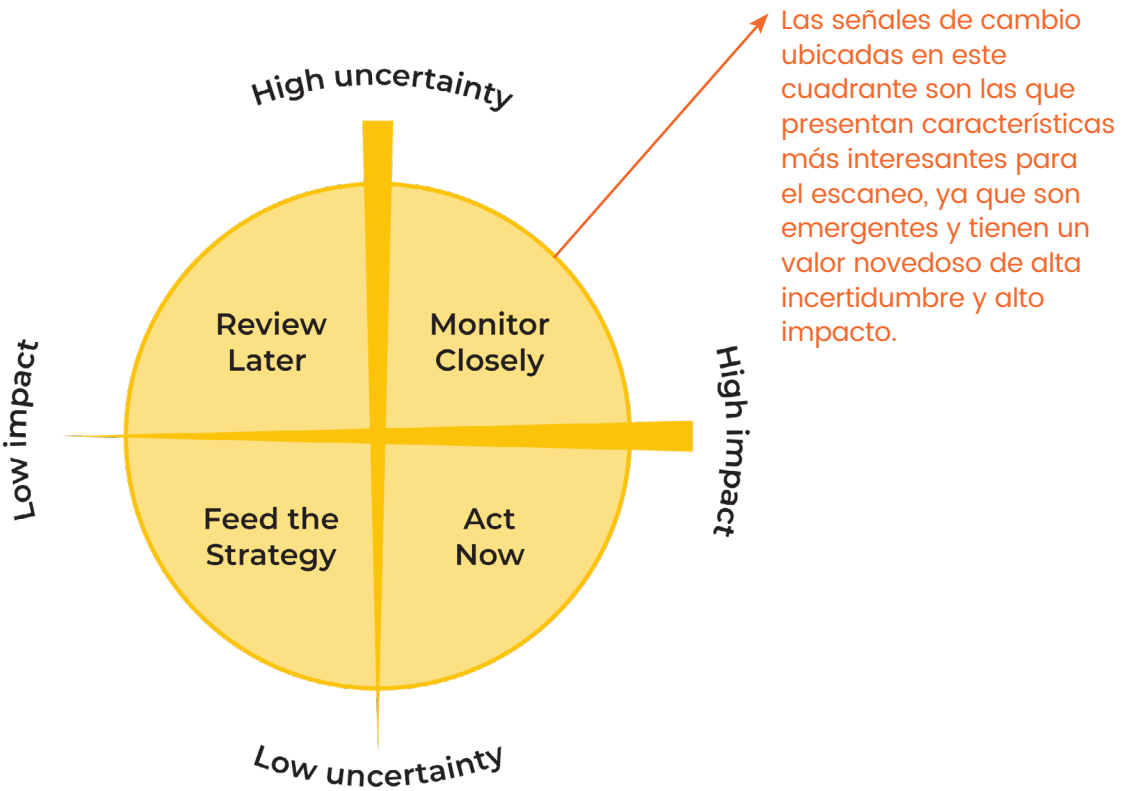
For this analysis, we recommend using the Delphi Method (Section 3.1) to make it easier for experts to collaborate and define the level of uncertainty and impact of each signal of change.

We mean the current lack of certainty about the signal of change and possible future consequences of uncertainty. It is a matter of asking ourselves how much we know about potential evolutions of the signal of change under analysis. On the other hand, the level of impact assesses the degree of transformation that the signal of change would imply for the study's target audience or our organization, should it become massive. In other words, it helps us to assess the extent of the consequences, either positive or negative, that the signal of change could have if it were to go mainstream.

The uncertainty and impact matrix guides us in understanding what to do with each identified signal of change. By combining both parameters (i.e., uncertainty and impact), we obtain four quadrants that help us decide how to proceed when faced with different signals of change (Figure 7). To illustrate this point, we can use the example of the deepfakes. At Co_Lab, we assessed that this signal of change has a high degree of impact, as it challenges society's ability to judge reality itself. This can potentially unleash serious crises of trust in public institutions and take part in the spread of misinformation (Parkin, 2019; La Nación, 2019). Likewise, artificial intelligence technologies in video production also present challenges regarding protecting personal image rights (Çolak, 2021). As for its level of uncertainty, we also consider it high, as it is a force of change that is still developing. This combination of a high level

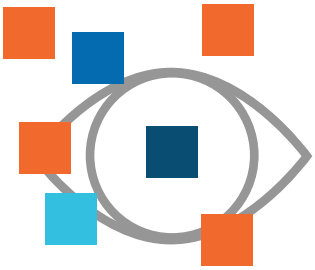
of uncertainty with a high level of impact implies that it is placed in the "Monitor Closely" quadrant (see Figure 6). We should remain vigilant to developments related to this type of signals of change. The idea is to remain perceptive to news, studies, reports about the signal of change and its socioeconomic, technological, and political impacts, among others. The signals of change classified in this quadrant are particularly important, as they could have a high impact on our organization or target audience. Still, we are uncertain whether they will develop. Therefore, it is worth monitoring them closely.

Figure 8. Uncertainty and impact matrix.



Source: Adapted from Future Today Institute (2019).

Once the uncertainty and impact analysis is completed, we approach the end of the convergence stage. At this exploration stage, we developed a detailed database for each of the selected signals of change that includes its description, an example or reference, a relevance assessment, a consequence analysis, and uncertainty and impact analysis. In the next step, we will organize all these elements visually.

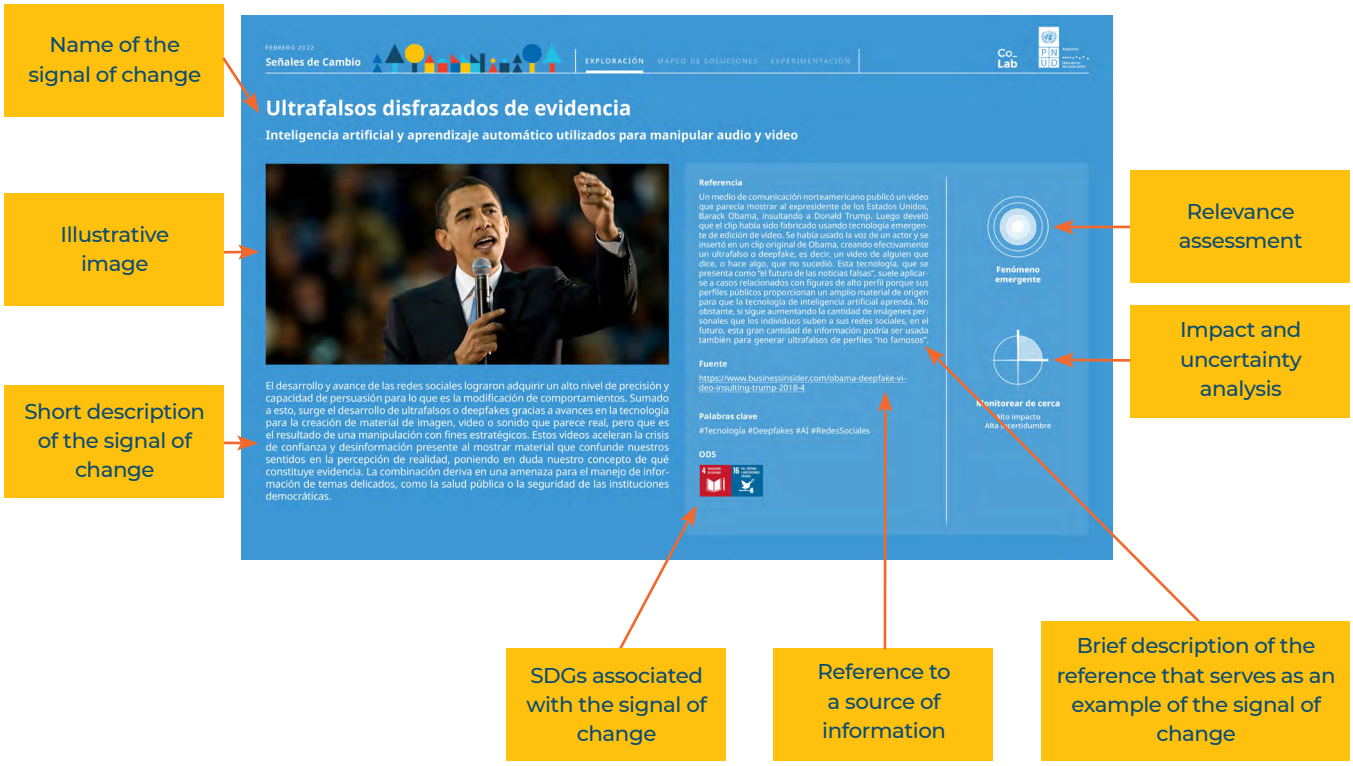


3.4 We visualize signals of change

We provide a visual format to showcase the signals of change.

The visual sheet is a tool to communicate the critical information of each signal using images and graphics, facilitating their usability (Figure 9). We suggest including a description, example or reference, relevance assessment, and uncertainty and impact analysis in the visual sheets.

Figure 9. Name of the signal of change.



Source: Accelerator Lab of UNDP in Argentina.

This visual sheet is a suggested model. However, new visual models could be adapted to our organization's needs or objectives. We could have chosen not to conduct an uncertainty and impact analysis, in which case, that element would not be included in our visual sheets. Our team may not have the capability of producing such visual sheets. We may, therefore, choose a simpler visual format too.

Figure 10 shows the result of Co_Lab's exploration work. We showcase a total of 53 visual cards representing the signals of change that we have selected and analyzed in detail, which are relevant to the development of Argentina by 2030.

Figure 10. Animated signals of change identified and selected at Co_Lab. They can greatly impact Argentina and its development by 2030.

Source: Accelerator Lab of UNDP in Argentina.

Since each reference sheet explains the signals individually, we detail below only a few examples of signals of change. Throughout the text, we have already highlighted the signal of change regarding deepfakes, so we would like to emphasize another signal of change that we also placed in the "Monitor Closely" quadrant, which is of utmost importance for organizations. The UBI token for universal basic income in blockchain indicates the use of blockchain technology for the payment by private organizations or by the government of social assistance to citizens. As it is a disruptive paradigm in terms of private or public benefits for the population and offering other benefits, such as identifying people in a digital space, we consider this a signal of change with a high potential transformational impact. Alongside this, we also conclude that this signal of change is still marked by a high degree of uncertainty, as blockchain technology and its applications are still under development. Thus, the signal of change combines high impact and high uncertainty. In our collective intelligence exercise, the group identified the possibility of ending irregular practices, such as political patronage, as an advantage of this signal of change. It also highlighted the potential of the scope of blockchain technology, given that it enables funds to reach vulnerable populations. On the other hand, the group pointed out that the technology's complexity and the existence of a digital divide may be a disadvantage. Also, the collective debate emphasized the tension between governmental control and the decentralized nature of blockchain technology.

Digital civic online reasoning and digital social interaction through video games were two other signals of change. They were placed in the " Monitor Closely " quadrant since they represent a high impact and uncertainty about their future development. In other words, it is advisable to monitor their development. Civic online reasoning refers to promoting information literacy that helps citizens distinguish between true and false information circulating on the Internet. On the other hand, digital social interaction through video games has to do with how video game platforms are becoming virtual spaces where audiences, with a large percentage of young people from Generation Z, interact and experience cultural exchange.

We identified antibiotic resistance as a signal of change in the "Act Now" quadrant. According to the World Health Organization (WHO), "antibiotic resistance is currently a major threat to global health, food security, and development" (WHO, 2020). Hence, we assigned it a high degree of impact. At the same time, the level of uncertainty regarding its characteristics and future consequences is low. In 2014, WHO started to develop information on the signal of change and, since then, awareness and actions taken in this regard have increased (MSF, 2018). The fact that we have placed this signal of change in the "Act Now" quadrant indicates that, for Argentina, it is important to review and implement policies.

In the "Feed the Strategy" category, we placed the signal of change resilience to extreme weather events. We observe a low level of uncertainty as to the characteristics and consequences of this signal. At the same time, we notice an uneven and incipient development of this signal of change which overall could be considered that diminishes its potential massiveness. Hence, we placed it in the " Feed the Strategy" quadrant to look deeper and learn more about it to understand how it can enhance current climate action initiatives, projects and policies.

Finally, we refer to decentralized justice through blockchain as a signal of change that uses blockchain technology for conflict resolution. This signal of change has a high degree of uncertainty because the integration of blockchain technology in this field is still at an early stage. As to the impact of this signal of change, similarly to resilience to extreme weather events, its still early and irregular development undermines its massive impact. Given these characteristics, we have placed this signal in the "Review Later" quadrant. This means that it is advisable to monitor its evolution but not as closely as signals placed in the "Monitor Closely" quadrant.

As seen in the previous paragraphs, describing signals of change using text may be a daunting task. Hence, we introduce the rest of the signals of change directly in visual reference sheets, which can be seen in detail in Figure 10. In turn, they can be used in many ways, such as:

Triggers for cibversations

Triggers for conversations with colleagues, community members, or experts.

Tools to explore

Tools to explore how signals of change interact with each other or affect the community or organization.

Material for collaborative

Material for collaborative exercises of innovation or collective intelligence.

Work dynamics

Work dynamics for organizational resilience.

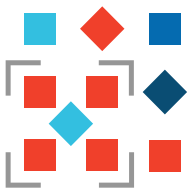
Strategic planning debates

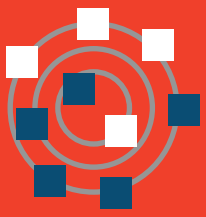
Strategic planning debates and decision-making.

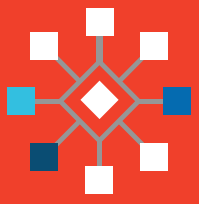
As the visual sheets provide a simple and clear way to introduce the signals, they can be consulted by anyone in the organization or the community. Ideally, they can be the basis for making evidence-based strategic decisions and increase the resilience of our organization against future scenarios.

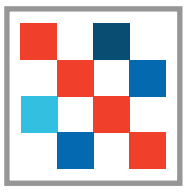
5. Conclusions

Conclusions









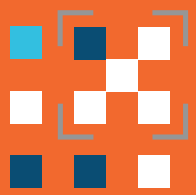
With this exploration guide, we invite organizations and teams to engage in an active and systematic process of searching for, identifying, analyzing, and summarizing information about signals of change. By doing so, we can strengthen our ability to foresee unexpected changes, which is of utmost importance for strategic decision-making and organizational resilience.

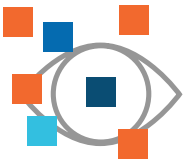
Exploring possible future scenarios is increasingly critical given the high levels of volatility, uncertainty, complexity, and ambiguity of our surrounding contexts. However, exploration is not a simple task. Therefore, using strategic prospective analysis tools, collective intelligence, and horizon scanning, Co_Lab presented a guide that proposes an exploration methodology, thus paving the way to create resilience and innovation strategies.

The methodology in this guide enables the systematic collection of information about signals of change based on a divergence and a convergence stage. Each includes a series of steps that successively and progressively build knowledge about possible future scenarios relevant to our organization or target audience.

The first step of the divergence stage is defining its scope and planning its execution. In the next step, we emphasize digging into unconventional sources of information that are rarely consulted. We emphasize being perceptive to early evidence that may indicate signals of change. As a result of this step, we gather a large volume of information and data. Hence, in the next two steps, we identify, describe, and classify the data into signals of change. To carry out these tasks, it is essential to use IT tools to systematize all the information collected in a digital database. We then move on to an analysis of the possible future consequences of the signals of change. This step helps us to understand how much we know about the identified signals of change and recognize possible signals that we did not yet consider. We conclude the convergence stage with an extensive list of signals of change, each of them identified, described, and classified.

We then move on to the convergence stage, summarizing and analyzing the extensive list of signals of change that emerged from the divergence. We should begin by discussing the relevance of the signals of change to our organization and the target audience of the exploration. This step allows us to identify the signals of change that have the strongest link to our exploration objectives. We then move on to uncertainty and impact analysis, which tells us what to do and how to act concerning the signals of change. So, for example, if we discover that one of the signals of change has a high degree of uncertainty and a high degree of impact, we recommend monitoring it closely and assigning a person from our team to look into it further. This is because it may have important consequences if it develops. Finally,



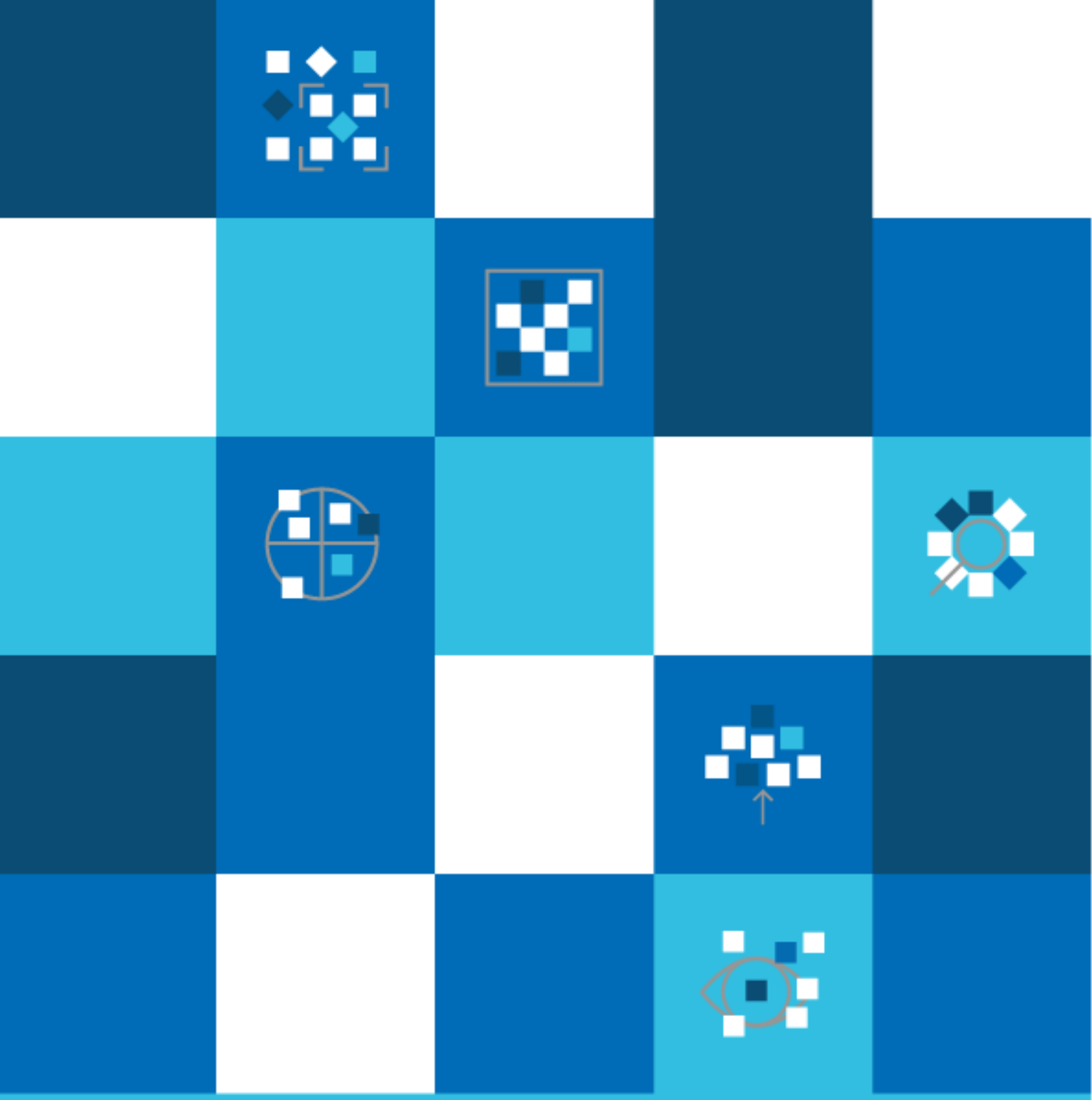


the convergence stage finishes with a step to use visual supports to summarize and communicate the exploration results.

The methodology described can be considered a two-stage, step-by-step approach or a starting point for developing more complex future scenario study methodologies tailored to specific needs. Identifying signals of change allows us to increase our organizations' or work teams' capacity to adapt and foresee future scenarios, which improves our resilience to unexpected changes. Therefore, exploration should become a common and frequent practice.

Co_Lab put this guide into practice by exploring "What signals of change will have a high impact on Argentine society and its development towards 2030? During the divergence stage, we started with 83 signals of change. After the convergence stage, we analyzed and visualized 53 signals of change, for which we estimated their uncertainty and impact. For example, based on that analysis, we identified "Monitor Closely" as an action to be taken for signals of change such as deepfakes. We introduced many other signals of change relevant to Argentina within social, economic, technological, environmental, and health environments. Therefore, readers will be able to discuss internally in their organization or team signals of change that may be of interest and help them make strategic decisions.

We suggest that the final products arising from exploration should not be static. The database can be updated over time. In addition, the visualization sheets are created to stimulate strategic planning debates and new findings. Thus, a proactive attitude can be adopted to avoid or reduce the impact of threats and accelerate opportunities with new initiatives or actions. It is of utmost importance that the public sector and partner organizations adopt strategies and methodologies for studying the future. In this way, they can develop evidence-based resilient policies and strategies to prepare our society for its rapid transformations.



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