
Patterns of Anticipatory Assumptions

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Abstract

Human behavior is mostly anticipatory and based on anticipatory systems and models. As Robert Rosen (2012) pointed out, different models of a natural system may lead to different predictions about its future behavior and to different courses of action in the present. Therefore, it is important to make visible those different models and their constituent assumptions in the present. While the future does not exist in the present, anticipatory assumptions can be observed using devices such as Futures Literacy Laboratories. So far, there is no systematic analysis available of a larger set of actual assumptions that were revealed in these laboratories. This paper narrows that gap in previous research and surfaces patterns across such assumptions.

This paper uses a unique database of assumptions compiled by the author. The 500 assumptions came from participants during eleven Futures Literacy Laboratories. The assumptions in the database usually comprise a single sentence. The analytical method of choice to reveal the patterns across these assumptions is an inductive qualitative content analysis. It starts with keywords and then the identification of categories. The analysis here had to abstract from the specific topics of the laboratories and look for cross-cutting issues.

The pattern of assumptions found in this specific database by this specific researcher includes 18 categories that were sorted into four meta-categories and then structured into a “P1 Futures Assumptions Hexagon”. The hexagon (or variants of it from other databases) could be used for multiple purposes: In any futures-related project, it could help structure the conversation and focus on blind spots as well as the historical roots of the specific assumptions. Agreements and disagreements among participants could be mapped onto the hexagon’s categories to identify the focus of future work. Also, it could provide anchors for the creation of new, alternative futures that broaden the space of imagination for example in the second phase of a Futures Literacy Laboratory.

Keywords

Futures Literacy, Assumptions, Anticipation

1. Introduction

Anticipatory assumptions are the key building blocks of our images of the future, of our anticipatory systems and processes. They influence what we sense or perceive in the present. They shape what we do in the here and now. Therefore, they are a key object of investigation in futures projects, often as the basis for thinking about alternative images of the future in a reframing exercise. However, the author is not aware of a systematic study of

assumptions that have been revealed in futures projects, for example in Futures Literacy Laboratories.

Using a database of 500 assumptions, the main purpose of the research summarized here was to uncover patterns across these assumptions and to describe them. While working on the database, new ideas emerged on how these patterns could be used in futures projects for deeper discussions and for the reframing phase of Futures Literacy Laboratories.

The note first provides a brief overview of the role of anticipatory assumptions in futures work. Then the way the data (assumptions) was collected is presented, followed by a description of the analytical procedure, the inductive qualitative content analysis. The core part of the note describes the patterns uncovered and introduces the “P1 Futures Assumptions Hexagon” as a structuring device.

The intention behind this note was not to look for support or otherwise of a theoretical model in a deductive analysis. Rather, the purpose was to discover patterns across the assumptions collected in a specific way at a specific point in a Futures Literacy Laboratory, namely at the end of phase 1, the reveal. The Futures Literacy Framework (Miller 2018) covers a wider spectrum of assumptions, including those that could be used in the alternative future. At this stage, no database exists that includes assumptions revealed in both phase 1 and phase 2 of Futures Literacy Laboratories. Also, the work presented here does not describe the Anticipatory Systems and Processes that led to those assumptions.

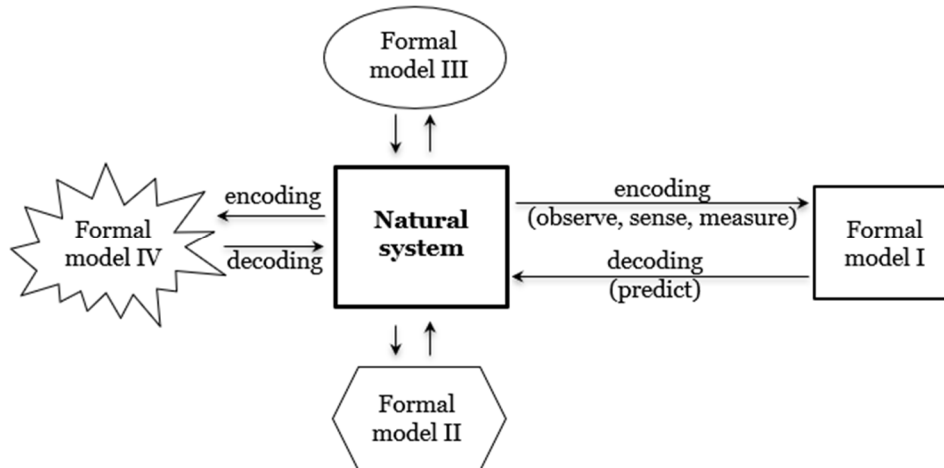
2. The role of assumptions in futures studies

Assumptions play an important role wherever models are used. For example, economics students learn early on that it makes a difference whether the model at hand assumes a fixed exchange rate or a flexible exchange rate, a closed or an open economy, agents with rational expectations or bounded rationality. According to Merriam-Webster, an assumption is "something taken as being true or factual and used as a starting point for a course of action or reasoning". Wikipedia refers to a statement where “the truth value of a statement may be true irrespective of whether or not it is known to be true”. The simpler, condensed definition used for this paper is “a statement that is not known to be true yet but might be proven later.” This distinguishes assumption from facts, which are known to be true already today. Beliefs are more related to religion, where proof is not required. The terms “axiom”, “premise”, “postulate” and “conjecture” have similar meanings to assumption, while “hypothesis” appears to be weaker.

The increasing focus on models and assumptions in futures studies stems from Robert Rosen’s Theory of Anticipation. In his seminal book “Anticipatory Systems” first published in 1985, he traces his discovery to situations of conflict: “it appeared that the roots of conflict lay not so much in any particular objective situation, but rather in the fact that differing models of the situation had been adopted by the different parties to the conflict; consequently, different predictions about the situation were made, and incompatible courses of action adopted.” (Rosen (2012), page 7 in the 2nd edition of 2012).

In his Prolegomena to the 2012 edition of “Anticipatory Systems”, Mihai Nadin illustrated these modeling relations: A natural system is observed and encoded into a formal system or model, which is then used to make predictions about the natural system. Louie (2010) shows the same figure as Nadin. Adding Rosen’s focus on different observers, the following illustration shows different formal models of the same natural system.

Fig. 1: Different anticipatory models of the same natural system



Source: Stefan Bergheim following Mihai Nadin (2012), Aloisius Louie (2010), and Robert Rosen (2012)

The Theory of Anticipation was further explored by Louie (2010) and in the Handbook of Anticipation edited by Roberto Poli (2019). Louie refers to the differences between assumptions made in the Newtonian paradigm and those in anticipatory systems theory. Poli explores, for example, the importance of the assumption of continuity in futures work, especially for forecasting.

Based on the collaboration especially between Roberto Poli and Riel Miller, the Theory of Anticipation and the term “anticipatory assumptions” was introduced to futures studies in the 2010s. This collaboration led to the publication in 2018 of “Transforming the Future – Anticipation in the 21st Century” edited by Miller. This book also includes a method to reveal those anticipatory assumptions: the Futures Literacy Laboratory. It is the method employed to collect the data for this paper.

Assumptions are building blocks of the models that determine what we imagine, sense, perceive, and do in the present. Even more, assumptions and images of the future are the only thing we can know and analyze in the present, where the future does not exist. As Miller (2018, p.95) puts it: “The first goal of any process meant to research or develop Futures Literacy (FL) as a capability must be to find a way to make anticipatory assumptions (AA) explicit and observable.” Awareness of these assumptions allows us to explore alternative or novel sets of assumptions, images, and actions in the present, and to change the conditions of change. Tuomi (2019) uses the term “ontological expansion”. In addition, and in Rosen’s spirit, an awareness of the assumptions of other actors allows a deeper understanding of conflicts and the search for solutions.

3. The data collection mechanism

The 500 assumptions analyzed in this paper come from a selection of 11 Futures Literacy Laboratories held between March 2021 and September 2023. More assumptions would be available. The 500 cutoff was selected to keep the database manageable. In selecting the 11 laboratories, the first focus was on the four held in English, to limit translation issues. Assumptions from the seven laboratories in German were translated using [deepl.com](https://www.deepl.com). The second focus was on corporate or professional contexts with experienced participants. The idea behind this criterion was that a high level of experience and a high relevance of the laboratory's outcomes for their work might potentially lead to particularly deep insights on the topic. This implied leaving out ten open laboratories with mixed participants who usually are primarily interested in experiencing the method. Nine of the selected laboratories were held online with harvesting in Miro, two were onsite. The typical time horizon used was the year 2040.

The topics ranged from “The Futures of Democracy” and “The Futures of Work” to “The Futures of the Metaverse” or “The Futures of Learning”. Most laboratories were for around 30 participants. They were designed and facilitated by the author together with one additional plenary facilitator. The typical size of the breakout groups was five persons. The groups facilitated themselves and the plenary facilitators visited the groups as needed.

Within the laboratories, the assumptions were collected at the end of phase 1, the “reveal” phase. Before that, participants made visible their images of probable futures of the topic (forecasts, expectations) and their images of desirable futures (wishes, visions). This was always done first as an individual exercise in silence, then discussions in the breakout groups, and then some harvesting in the plenary.

After revealing their expectations and wishes, a short presentation by one of the facilitators highlighted the importance of assumptions for perception, sensing, and sense-making, in line with the previous section of this paper. In addition, a short preview into phase 2 of the laboratory was given, where participants would get an opportunity to experiment with different assumptions and futures of the topic.

To reveal assumptions, participants were asked to think about what lies behind or underneath their expectations and wishes. Why do they expect or wish what they did? Often a simple example was given using Columbus's expectation in 1492 that he would reach India by sailing westwards from Spain with the underlying assumption of the earth being round. One purpose of this example was to show the importance of assumptions for perception and action in the present.

The assumptions behind the expectations and wishes could be either a participant's own that they became aware of or those that they saw in the earlier contributions from other participants. The facilitator then reiterated that this sequence was not about wrong or right assumptions but rather about exploring the topic at a level that is not usually explored. To enable better understanding, participants were asked to include a verb in each assumption. This was to avoid statements such as “linear” or “linear thinking”, which are difficult to interpret, and could have been formulated as “Thinking is linear”.

Only four entries in the database did not have a verb, could not be interpreted, and were excluded from the next steps.

In online laboratories, participants first individually wrote down their assumptions in a Miro space. Then a plenary discussion would follow with the opportunity to add more assumptions. In onsite laboratories, participants wrote assumptions on cards which were collected, then read and clustered by the facilitators including a discussion. Typically, the activities related directly to revealing assumptions took about 30 to 45 minutes. Often the option of analyzing the roots and histories of the assumptions was mentioned at the end, but for lack of time usually not explored. Also, there usually was no analysis of the assumptions behind the assumptions. If an assumption was “Schools still exist”, then there was not usually a harvesting of the underlying assumptions of continuity of places of education. Phase 2 of the laboratory was the opportunity to take away such assumptions and experiment with different ones. Those alternative assumptions are not part of the database analyzed here.

4. Inductive qualitative content analysis

In compiling the database, each assumption was labeled with the laboratory where it came from, the topic of the laboratory, the type of participants, and the original language. Each assumption received a unique identifier, and all assumptions were counted until the cutoff of 500.

The path to uncovering patterns across the assumptions in the database was a purely inductive one, letting the data speak – as opposed to a deductive approach that uses categories from a prior theoretical basis (Kuckartz, 2012). This type of qualitative content analysis starts somewhere in the database and identifies keywords for the observations/assumptions. First ideas for categories are noted, which might help structure the overall database. In the present case, the first half of assumptions from five laboratories was analyzed in this way before convergence to a set of categories emerged. The challenge here – that prevented the use of artificial intelligence tools – was to abstract from the topics of the laboratories and not use those as keywords or categories. The purpose of this project was to uncover deeper patterns that may apply across a range of topics.

In the next step, the candidate categories were described in some detail. Potential overlaps to neighboring categories were examined which led to one merger. Category labels were adjusted after examining definitions in the Merriam-Webster dictionary. In addition, categories were ordered by closeness and initial ideas for four meta-categories emerged.

Using the 19 categories and their descriptions, the whole database was then examined and categorized. Then the number of assumptions in each category was counted. The candidate category “action” was excluded at this stage because there were too few assumptions on it. This is consistent with actions being the focus of phase 4 later in these Futures Literacy Laboratories. Twelve assumptions could not be allocated to one of the remaining 18 categories either because they did not include a verb, words were missing, or because they were questions. Two categories were kept despite a low count of assumptions because these categories were clearly different from the others and have the potential to inspire future work: spaces and tradeoffs.

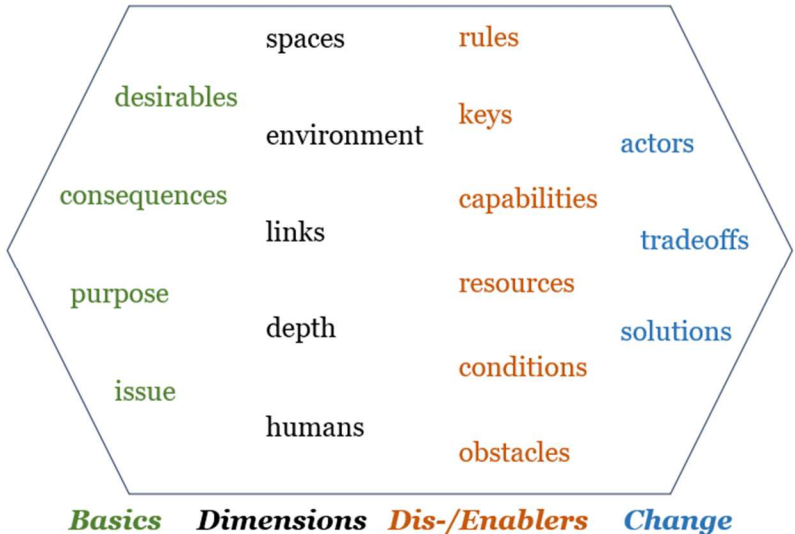
In the next step, assumptions in each category were examined together for commonalities and the description of the categories was developed further. Also, typical examples were highlighted in each category. Ideas for further work with the database were noted, such as the agreement index and the re-framing ideas described later in this paper.

The result was 488 assumptions distributed across 18 categories in 4 meta-categories. Given this large number of categories, ideas were developed to present them in a way that is easy to grasp, including a Futures Literacy hero’s journey and a Futures Literacy Canvas. The remaining idea was the “P1 Futures Assumptions Hexagon” (P1 indicating the phase of the laboratories, where the assumptions were collected), which partly mirrors the divergence-emergence-convergence flow often used in Futures Literacy processes.

5. Main results: P1 Futures Assumptions Hexagon

The inductive qualitative content analysis of the 500 assumptions from 11 Futures Literacy Laboratories led to 18 categories, which are shown in the “P1 Futures Assumptions Hexagon”. It includes on the left basic categories with assumptions about the issue of the laboratory, the purpose of the meeting, the consequences of (not) doing anything, and about desirable futures. Next are categories of assumptions about the different dimensions of the topic: about human nature, about the depth of the issue, the links to neighboring issues, the larger environment in which the topic is situated, and the spaces where things are happening on the topic. The third meta-category includes assumptions about dis-/enablers that prepare the ground for the later exploration of actions: The obstacles identified, the conditions for change, the capabilities and resources required, as well as assumptions about the key to change and the rules that are at play. Finally, the meta-dimension of “change” includes more concrete assumptions about solutions, potential tradeoffs, and actors.

Fig. 2: The P1 Futures Assumptions Hexagon



Source: Stefan Bergheim

In the hexagon, the categories are arranged by meta-categories, which follow a sequence oriented towards action. Alternatively, categories could be sorted by the number of assumptions in each. Such a ranking would start with 64

assumptions about the environment in which the issue is situated, followed by 50 assumptions about the conditions for change, 44 assumptions about possible solutions to the problems, and 38 assumptions each about the depth of the issue and about human nature. Most categories include between 20 and 30 assumptions. Categories with less than 10 assumptions are the ones on spaces, rules, and tradeoffs. As mentioned, those categories were kept in the hexagon because they offer different perspectives than the others.

The following descriptions of the 18 categories in the P1 Futures Assumptions Hexagon include examples of “typical” assumptions in each as well as some links to other categories:

1. Issue (21 of 488): Here participants become more aware of their assumptions about the issue, the theme, the topic of the laboratory, or the problem that was being addressed. Most assumptions are simple statements such as “topic X is underrated, is consensus, is bad, is good, is the best, is given, is a luxury, has a future, has flaws etc.” It appears important that these are brought to the open as they create more clarity on the issue. A typical assumption is “Trust is underrated”.

2. Purpose (28 of 488): This category includes the assumptions that participants reveal about the importance of working together on the topic. Many statements here show that something is not clear, cannot be taken for granted, cannot be afforded, is difficult, should change, or can be transformed. A typical assumption about purpose is “Democracy cannot be taken for granted”.

3. Consequences (24 of 488): The assumptions in this category are more forward-looking than those on the purpose of the meeting. Participants realize that the issue enables, helps, brings, leads to, enlarges, reduces, or is necessary for something else that is generally desirable. A typical assumption about consequences is “Cooperation brings better results in terms of diversity.”

4. Desirable (30 of 488): Since the assumptions were collected right after the discussions about desirable futures of the topic, it is not surprising that many relate to the futures that participants want. Typical words used here include peaceful, good, integrative, equality, enjoy, together, or goal. There is an obvious link to the purpose or motivation of the event, which could be to make the desirable futures more likely. A typical assumption about desirables is “We live peacefully together and want to do so.”

5. Humans (38 of 488): This first category in the meta-category of dimensions comprises all the assumptions about basic human needs, human nature, or human existence overall. People care, want, strive, feel, need, desire, prefer, enjoy, like, are. This is usually followed by something positive. A typical assumption about humans is “People need other people.”

6. Depth (38 of 488): Participants reveal assumptions about the deeper layers of the issue or at least the need to discuss what those might be. There are few typical words here other than “is” or “are”. It is also difficult to identify a typical assumption because they are all closely linked to the topic of the laboratory. “Leadership is a constant exercise”, “There is always a role for an educator” or “Time is a precious commodity” may provide a sense of the depth of these types of assumptions.

7. Links (27 of 488): The assumptions about the links to neighboring topics go beyond the core issue of the laboratory. Many bring in the role of nature, sustainability, transparency, as well as society overall. A typical assumption on links is “Ecology will play a dominant role in the future.”

8. Environment (64 of 488): This category is not so much about the natural environment, but about general external issues that are given or about trends. A lot of technology trends are included here (digitalization, artificial intelligence, machines, automation), but also increasing specialization, inequality, complexity etc. Some assumptions are about the stability or continuity of the environment: “States continue to exist.” “There will still be companies.”

9. Spaces (5 of 488): There are only a few assumptions in this category, but it was kept in the analysis because it is clearly different from the others and because it can inspire reframing futures. This category is about the spaces, locations, or places where the activity around the topic under investigation happens. Assumptions refer to the general importance of spaces, the characteristics of spaces, or their changing nature.

10. Obstacles (26 of 488): The meta-category of Dis-/Enablers takes the analysis one step towards actions. It starts with the obstacles, hurdles, barriers, or challenges that participants see, that need to be overcome or that prevent a different future. The obstacles cover a wide spectrum of issues. Examples can only roughly illustrate the character of assumptions in this category: “Too short legislatures harm democracy”; “Power is unequally distributed” or “Technology is taking people apart”.

11. Conditions (59 of 488): Many assumptions refer to the conditions of change. They are about what makes it feasible to do as needed, about what supports actions. There is some overlap with the categories about capabilities or keys in this meta-category. Here, more general assumptions are collected about aspects that are needed, necessary, essential, important, valued, or simply happening. A typical assumption on conditions is “Working together is essential.”

12. Resources (17 of 488): This category includes more concrete items that are seen as required to change things: money, influence, power, motivation, emotions, data etc. A typical assumption on resources is “There is enough budget to be able to implement improvements.”

13. Capabilities (12 of 488): Several assumptions refer to the capabilities, skills, abilities, or competencies of individuals necessary to work on the issue. A typical assumption on capabilities is “People have the ability to use technology sensibly.”

14. Keys (24 of 488): This category encompasses assumptions about concrete enablers that can provide direct access to the treasure chest of the desired future: tools, instruments, and most importantly technologies. A typical assumption on keys is: “Technology is THE enabler to democratic processes” (capitals in the original).

15. Rules (7 of 488): Only a few assumptions in the database refer to regulatory frameworks, institutions, or control mechanisms: What are the rules of the game, where do they come from, who sets them? This is a category with strong potential for reframing assumptions or introducing

novelty. A typical assumption on rules is “All countries will be willing to adopt the same regulatory framework”. There is some overlap with conditions.

16. Solutions (44 of 488): This first of three categories in the most action-oriented meta-category of “change” includes many assumptions about what should be done in general or in principle. Many of these assumptions include words such as automated, augmented, integrated, gamified, established, or individualized, but no concrete ideas about how to do that. A typical assumption on solutions is “Learning is becoming more individualized.”

17. Tradeoffs (4 of 488): A few assumptions refer to the awareness that more of something might come at the cost of something else – or not. There are different ways to express this such as “Progress works in a world without growth” or “humans enjoy learning vs. find learning cumbersome.” This is one of the small categories with a large potential for re-frames.

18. Actors (20 of 488): Participants also became more aware of potential actors who could do something about the issue, who could work against the obstacles, who might change the rules etc. mostly in general formulations: people, companies, leaders, the young. A typical assumption on actors is “The younger generation is leading the change.”

The P1 Futures Assumptions Hexagon can be used for several purposes. Some initial ideas:

- In a Futures Literacy Laboratory, the hexagon could be put on a wall or on an online whiteboard for participants to place the assumptions they discovered in the most appropriate category.
- Participants could discuss whether agreement on assumptions is likely or not and make these assessments visible on the hexagon (see next section).
- In a longer Futures Literacy Process the hexagon could be used to collect and structure assumptions from different laboratories on the same topic.
- When developing alternative futures, the hexagon could be used to identify blind spots that inspire alternative assumptions (section 7).

6. The agreement index

As highlighted in section 2, Robert Rosen initially came to think about anticipatory systems and processes in a conflict-prone environment. Therefore, it might be worth exploring the extent to which participants agree or disagree on each assumption. This has not yet been done explicitly in any of the laboratories that led to the data for this study, partly because of a lack of time and partly to not give too much attention to controversies, which might change the energy among participants in the laboratory.

As an exercise, the author assessed the potential degree of agreement for the assumptions in this database. In this “agreement index” a value of zero implies that it is straightforward to think of people who would completely disagree with the assumption. A value of one would mean that many people would probably have serious reservations about the assumption. On the

opposite end, a value of five means that there seems to be 100% agreement on this statement. A value of four means that most people would think that the assumption is probably reasonable. Two and three are for intermediate assessments.

Based on the author's subjective assessment, the distribution of assumptions is heavily skewed towards high agreement. In this exercise, 110 of the 488 assumptions received a value of 5, indicating likely full consensus. Examples include many general statements such as "Inclusive is difficult to achieve" or "A destroyed environment is an unattractive future for us humans".

Even more assumptions, 150, were assessed with a value of 4, where some small reservations appear likely. "People strive for justice" might seem to make a lot of sense, but maybe a few people work against it. "Working hours become more flexible" also sounds reasonable in general but may not apply everywhere.

On the other end of the spectrum, 44 assumptions were rated with a value of 1 in this exercise, indicating that many people would probably have serious reservations. Two examples: "Work is predominantly meaningful" might sound nice but "predominantly" seems a long way from reality. "Civilization will be relatively stable" also sounds like a wish given the current instabilities.

Only 13 assumptions got an assessment of zero especially because of the absolute style in which they were formulated: The "all" in "Machines will evolve to solve all problems" can quickly draw opposition. "There is equality of chances worldwide" would be less controversial with a "more" included.

In general, such a rating of assumptions depends heavily on the way they are formulated. "Learning can be more community-oriented" might be a 5; "There will be many activities to make learning more community-oriented" a 4; "Learning should be more community oriented" a 3; "Learning will be much more community-oriented" a 2; "Learning will be mostly community-oriented" only a 1 and "Learning will be only community-oriented" a zero.

By category, assumptions in this specific database about the environment and about conditions for change received the highest agreement values on average as rated by this specific analyst. By contrast, assumptions about capabilities, resources, conditions, and actors appear to be more controversial.

7. Use the P1 Futures Assumptions Hexagon for reframing

The 500 assumptions in this study were revealed at the end of the first phase of Futures Literacy Laboratories. In the second phase, participants were given opportunities to work with different assumptions and different futures. In some cases, these alternative, reframed futures were developed by the laboratory's designers before the event based on their assumptions about participants' assumptions. More recent laboratories invited participants to invent their own assumptions based on the ones revealed in the first phase. In each case, the P1 Futures Assumptions Hexagon can support the path to alternative futures. Here are some suggestions for each of the 18 categories:

1. The **issue** is difficult to reframe because that would totally change the focus of the event. But such a major reframe might be a worthwhile intervention in a longer process.

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2. A different **purpose** of the event might get invented in a “what if” spirit.
 3. **Consequences** of working on the issue could be questioned or removed. More interestingly, new consequences could be imagined.
 4. New elements of **desirable** futures could be introduced without discussions about whether participants really find them desirable.
 5. Certain **human** needs or characteristics could be removed from the discussions or new ones could be introduced.
 6. In the **depth** of the issue there are two options: Take away some of these deep assumptions or dig even deeper and invent new, deeper layers of the issue.
 7. The **links** to neighboring issues could be explored by focusing on these issues and looking at the topic at hand through that lens.
 8. Assumptions about the **environment** are easy to reframe, by taking them away or by changing the sign of a trend. Also, new trends and environments could be invented.
 9. **Spaces** are usually not talked about much in phase 1 of the laboratory, so they can be introduced out of the blue for phase 2.
 10. **Obstacles** could be removed or reduced in the alternative future. Introducing new obstacles includes the danger that the alternative future tilts towards a dystopia.
 11. **Conditions** are also quite easy to reframe: they could be given or be taken away completely. What can change the conditions of change?
 12. **Resources** could be given or taken away.
 13. New **capabilities** could be invented that go beyond those made visible in phase 1.
 14. New **keys** or tools could be invented that promise a more direct way to change. Some might have undesirable side effects, which would make the reframed future more interesting.
 15. New **rules** could be invented, old rules abolished. Furthermore, new systems to decide on rules could be developed.
 16. New **solutions** could be invented ex machina with a causal mechanism not previously thought of.
 17. **Tradeoffs** could be removed or stretched to an either-or setting.
 18. **Actors** could get superpowers or new allies. Alternative actors could be introduced.

In addition, new assumptions could be created by exploring the spaces between neighboring categories or by following paths from left to right in the hexagon. For example, assumptions in “environment” and neighboring “keys” could inspire new assumptions. Or moving from “humans” via “conditions” to “solutions” might bring about interesting insights.

6. Conclusion and Outlook

Much work is still needed on identifying, capturing, and analyzing anticipatory assumptions. This note only drew on a specific sample of assumptions drawn at a specific moment of a specifically configured observation method and then analyzed by a specific individual.

Other databases of assumptions could be drawn at other moments of Futures Literacy Laboratories or with other prompts by the facilitators. This might lead to different patterns.

In other laboratories, more time could be spent on revealing and capturing the assumptions below the first layer, which might lead to different types of assumptions and different patterns.

Other capturing devices than the Futures Literacy Laboratory method could be used in other contexts and might lead to different assumptions and patterns as well.

Different analysts may see different patterns in the database of this note. Please get in touch if you would like to get access to the database.

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