



The future of science in society

Report on the CGEE – Unesco
futures literacy workshop



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Executive Summary

Making decisions that embrace complexity, treating uncertainty as a resource not an enemy, calls for a significantly enhanced capacity to use the future to understand the present. Building this greater capacity rests on bringing anticipation out into the open as the way the future exists in the present. Doing so makes clear that conscious human search and choice deploy a range of different anticipatory systems to invent and apply the future to practical decision making. An applied anticipatory systems approach to using the future provides policy and decision makers as well as individuals with an enhanced capacity to both question and invent the anticipatory assumptions that inform their choices.

The workshop “The Future of Science in Society”, co-organised by CGEE and the Foresight Programme of Unesco, took place as a satellite event of the World Science Forum in Rio de Janeiro on 28 and 29 November 2013. The workshop had three primary goals. The first was to guide participants through a learning-by-doing process that challenged the implicit and explicit anticipatory assumptions they use to think about the future. In doing so the objective was to test and refine the Futures Literacy methodology being globally shaped through the project entitled “Networking to Improve Global/Local Anticipatory Capacities – A Scoping Exercise”, which is being implemented by The Foresight Programme of Unesco. Also, to support CGEE in changing its approach to developing and addressing new strategic questions, in recognising new issues which merit further investigation via systemic and systematic observations and dialogue, as well as in transforming its way of designing, organising, implementing, managing and evaluating its foresight and strategic studies.

Participants went through a Futures Literacy knowledge laboratory that advanced their capacity to make strategic decisions in contexts of ambiguity by more fully exploring the potential of the present. The objective was to help ensure that diversity and complexity can serve as sources of inspiration; a way to embrace the dazzling heterogeneity of the world as well as to respect the creative spontaneity of freedom and serendipity.

Intended outcomes included learning about the anticipatory assumptions we use to imagine the future of a particular subject under analysis (i.e. science in society) in order to be able to expand our understanding of the present by posing new questions. Also, to test the approach and unlock specific methods which will then be embedded in the on-going development of foresight methods and applications at CGEE and Unesco.

In Phase 1, participants were asked to talk about their future expectations and desires with respect to the different roles of science in society. Generally speaking, participants' main assumptions centred on the relationship of science to technological development. Within this science-technology nexus they tended to focus on how in the future science-technology would resolve a vast range of existing challenges and problems as well as enable the knowledge sharing that empowers individuals and societies.

In Phase 2, participants were provided with a reframing model (Learning Intensive Society) that they could use to describe a “disruptive” or “systemically discontinuous” imaginary future. This model was designed without reference to probability or desirability. In other words there is no expectation that this imaginary future will or will not come to pass or that it will be “good” or “bad”. The point of the model is to give participants a few descriptive variables and functional relationships that depart from existing dominant societal attributes and organizational forms. The model is meant to equip participants with new or unfamiliar elements for describing the future. This is an “outside the box” image or “theatre stage” that can inspire creative thinking about the nature, role and organisation of knowledge production in general and scientific activities in particular. The main assumptions of this alternative future ‘world’ are that the conditions for fluid communication, rapid sense-making, spontaneous innovation and unique creation make organisational and governance systems more open, diverse and dynamic (easier and more rapid birth, death, entry and exit). The Learning Intensive Society is a societal model that embraces novel emergent complexity and treats uncertainty as a resource not a threat.

In Phase 3, participants identified new questions, especially those which might have been considered unimportant or incomprehensible without going through the process. These included questions around the role and identity of scientists, their way of working and their beliefs, the ways in which science is performed, evaluated and communicated, the ways in which science and constant learning (education) can become ambient and evolve towards capacity-based systems, as well as the roles and configurations of government and countries.

A variety of facilitation processes aimed at moving knowledge from tacit to explicit, as well as inventing new hypotheses, variables and models, were used in the different phases of the process. One of the tools used to deepen and broaden the content of the structured conversations in Phases 1 and 2 was a technique called Casual Layered Analysis (CLA), which is a powerful tool for helping participants to make sense of their narratives by organising and communicating attributes of the imaginary futures described by participants. Other methods, such as role-play, storytelling and the use of different media for communicating results, were also used in both breakout groups and plenary sessions, allowing for experiments with different kinds of group dynamics and imaginative processes.



Such diversity in the design of the knowledge laboratory processes is key to sparking creativity within groups. Beyond increasing creativity this also makes the event more pleasant and helps to energize the process. Ensuring that individuals can make personal contributions in an interactive, shared sense-making context, is critical for tapping into the collective intelligence of the group and requires a strong emphasis on the design and “real-time” facilitation of the group dynamics.

Meeting these collective intelligence knowledge laboratory objectives and criteria require careful design of the process. This includes defining clear roles for participants, facilitators, and observers, as well as a step-by-step process instruction for each phase, including guidelines on how to handle group dynamics. These should be discussed amongst the facilitators prior to the meeting and on the basis of a confirmed list of participants so that the design can take into account the specificity of the people in the room as well as the physical aspects of the place and the surrounding context of events. Often it is best to clearly introduce the process instructions in plenary before each breakout group discussion in order to create a good working environment amongst groups as well as contributing to the organisation of the overall workshop results, rather than leaving decisions about process to each facilitator. The design should also include details related to size and mix of groups, room layout, logistics and supporting materials; all of which are important to create an environment of openness, creativity and permission. Reading material should be given either before the workshop or at the end as a way to help consolidate what participants have learned about an anticipatory systems approach to using the future to understand the present.

Finally, some sort of process for debriefing or thanking participants must also be designed and the set-up of an online network or newsletter informing participants about progress is important so that participants can become part of the growing network. Signalling that there will be follow-up questionnaire can also be quite useful, not only for getting feedback on the process and continuing the joint knowledge creation, but also for closing the overall process with a promise of more to come. The dramatic flow of the entire workshop, which needs to be designed for the specific topic and group of participants, taking into account cultural and social specificities, is an important part of the overall design and one of the keys to a successful process.



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Introduction

The aim of this report is to capitalise on the process and to highlight the main lessons learned from the workshop “The Future of Science in Society”. The workshop was co-organised by CGEE and the Foresight Programme of Unesco It took place as a satellite event of the World Science Forum in Rio de Janeiro on 28 and 29 November 2013.

The workshop is in line with a transformative process CGEE has been currently undertaking. The institution is changing its approach to design, organise, implement, manage and evaluate its foresight and strategic studies. The institution has been moving from a normative and prescriptive approach to one that embraces complexity, emergence and novelty. This implies developing the ability to “walk on two legs”¹: improve or optimise the current system at the same time as it moves towards new and/or disruptive system configurations. Being able to operate both in known systems (inside-in, inside-out, and outside-in) with more efficiency and efficacy as well as to operate in unknown systems (outside-out), according to Figure 1, will support the institution in crafting strategic questions for itself and its clients. In other words, looking outside systems which we are familiar with will support not only developing and addressing new strategic questions, but also in recognising new issues (e.g. challenges, technologies, social transformations, etc.) through systematic observations and dialogue, and selecting those which are worth further investigating in order to identify new opportunities.

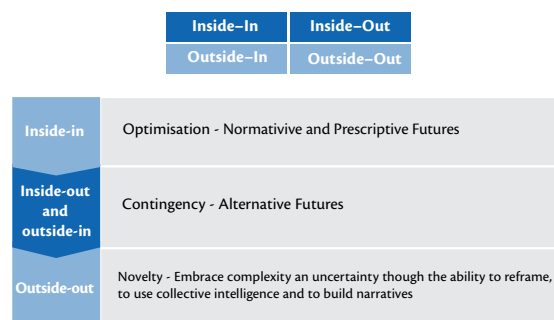


Figure 1. Operating both in Known and Unknown Systems

¹ Walking on two legs refers to the ability to use closed and open systems thinking at the same time. This means being able to detect and invent novelty (innovation as “ontological expansion”) using two distinctly different kinds of imaginary future: one in which the model used to imagine the future is constructed with the aim of prediction and the other in which the model is unconstrained by predictive or normative constraints.

The Foresight Programme of Unesco has been implementing the project entitled "Networking to Improve Global/Local Anticipatory Capacities – A Scoping Exercise" under a grant agreement with The Rockefeller Foundation. This is a collaborative project conducted with partners from around the world, including The Rockefeller Foundation, CGEE, Innovation Norway, the South African node of The Millennium Project, among others. The project is an innovative exercise to conduct a scoping process to identify the wide range of communities of practice using anticipation and foresight in a variety of themes. One important component of the scoping exercise is to hold Local Scoping Exercises (LSE) in different regions around the world. The LSE provide a general structure for using the future to understand the present, taking advantage of the specific knowledge and interests of participants to generate new knowledge and alternative options for decision making.

Clear outcomes are expected in the process of working through LSE in general and from the workshop "The Future of Science in Society" in particular. The first is to share our hopes and fears, expectations and doubts, and discover points in common as well as differences. Second, is to make tacit knowledge explicit and to expand our anticipation data set by incorporating a range of different aspects of the present, including internal specifics like emotions and personal history (what we know about how we use the future and what we imagine about the future). Third, is to bring anticipation out into the open as the way the future exists in the present, which offers in a sort of self-conscious way (meta-cognition) a learning-by-doing entry point into a expanded understanding of anticipation (models, systems, processes) – what might be called Futures Literacy. Fourth, is to learn something about the anticipatory assumptions we use to think about the future of a particular subject under analysis (i.e. science in society) in order to be able pose some new questions in the present. Finally, to identify participants' anticipatory systems in terms of networks or specific communities of practice and methods or specific aspects of the Discipline of Anticipation², which will then be embedded in the continual foresight methodological development of CGEE and Unesco.

Following an overview of the process behind the LSE, this report explains the approach employed in the workshop "The Future of Science". The main assumptions of each phase – expected/desired futures, reframed futures, and using the future to expand our understanding of the present – are outlined, and new questions previously considered as unimportant or incomprehensible are then articulated.

The conclusions or lessons learned are then presented aiming to serve both as input for refining the methodological approaches employed at CGEE and as feedback for organising other Futures Literacy Unesco Knowledge Labs (FL Uknowlab) or Local Scoping Exercises (LSE).

2 <<http://www.fumee.org>> and Unesco Chair in Anticipatory Systems <<http://www.projectanticipation.org>>



Methodology: Futures Literacy³

Futures Literacy provides policy and decision makers with an enhanced capacity to both question and invent the anticipatory assumptions that inform their choices. Such ability is acquired by undergoing a learning-by-doing process or FL Uknowlab. This is a collective intelligence workshop designed to assist us to collectively identify and invent anticipatory assumptions that at once enable us imagine the future and make choices in the present. Its collective intelligence process reveals and challenges the implicit and explicit anticipatory assumptions we use to think about the future. Participants of such process engage in a simulation that advances their capacity to make strategic decisions in contexts of ambiguity by more fully exploring the potential of the present so that diversity and complexity can serve as sources of inspiration; a way to embrace the dazzling heterogeneity of the world as well as to respect the creative spontaneity of freedom and serendipity.

Futures Literacy is a systematic approach to improving the capacity of our anticipatory systems. Decision makers who are futures literate have a more explicit awareness of the expectations and values that shape their (and their community's) view of the future. They are also better able to design collective intelligence processes that use the future to see opportunities in today's intricate, fluid and spontaneous world. Ultimately, by opening up what we imagine to be the future assists us with a fuller appreciation of the potential of the present. The workshops are carefully designed to achieve this objective.

The design of the FL Uknowlab starts from the premise that everyone uses the future everyday. People use the future in the sense that they develop and deploy anticipatory assumptions, from such simple ones as the sun will rise tomorrow to more vague ones like I hope my university diploma will be useful. Anticipation is part of everything around us, it is a defining attribute of a universe in which time and space are in constant motion, for instance part of what defines our planet is lateness and elsewhere-ness. Trees also display a form of anticipation when the leaves fall off as winter approaches. And of course humans practice many forms of anticipation, including non-conscious anticipation that occurs when our immune system prepares for a threat. Conscious anticipation also takes many forms, from simple tracking of a moving object and imagining where its trajectory and speed might take it to dreaming up elaborate images of tomorrow. These imaginary futures to help us figure out what is going on around us, make choices about what is most important to pay attention to, and select which assumptions will guide our actions. Tacit assumptions about these imaginary futures

³ Annex 1.

often play a role in the development of states and societies, be it in research or in virtually any other aspect of public affairs. Conscious anticipation is not the only factor influencing our sense making and decision making in the present but it is often a very important one.

The FL Uknowlab follows a learning curve sequence that is intended to engage the collective intelligence of participants. The FL Uknowlab discussion moves through three phases. In the first Phase participants are asked to think about predictions and hopes. This is the easy part of the learning curve which aims to convert tacit knowledge into explicit. Predictions are about what they think is most likely to take place – a snapshot in everyday life in the long-run future. Hopes are about their values; what they would like to see in the future. Ultimately, Phase one shall bring about awareness that we all use the future in our daily lives even if not conscious of such process. At the same time, the process shall clarify our diverse modes of thinking about the future, making these explicit.

In the second Phase we leave behind probable and desirable futures to experiment with a discontinuous framework, a new set of colours and brushes for painting an imaginary image. This alternative framework should be provided as a sort of new palette for participants to experiment with. To be clear, there is no suggestion that this alternative future is likely to happen or is even desirable, the point is to experience the power of our anticipatory assumptions in shaping the futures we imagine and the potential to address the creative challenge of inventing paradigmatically different futures. This is the steep part of the learning curve were participants engage on a rigorous imagining process that is designed to “reframe” the future, enabling the development of systemically discontinuous but operationally detailed (organisation/functions) descriptions. Here participants are guided to imagine changes in the conditions of change in the way people use the future.

Finally, in the third Phase the conversation moves to an examination of the way anticipatory assumptions influence our understanding of the present and how specific images of the future make meaningful or visible different aspects of the present. Hence, we return to the initial decision making context to test new questions and identify choices. The design of the process is meant to ensure congruence between the narratives that describe the future and the narratives that shape decision making in the present. In this last Phase the challenge is to think of new questions, ones that might have been considered unimportant or incomprehensible without imagining the future using different anticipatory assumptions.



The Workshop: Imagine the Future of Science in Society

What is science? What is knowledge creation? There are many answers. The working definition, meant to serve as a starting point for the conversations at the workshop, is that science is a set of specific methods and relationships that enable humans to continuously negotiate their understanding of the world around them⁴

Knowledge creation encompasses the learning processes, internal and external, that produce knowing in all its forms (see Figures 1 and 2 in Annex 2). The point was not to debate definitions but to find starting points for collaborative exploration of how our ideas about the future influence our understanding of the present. This FL Uknowlab has been devised as a collective intelligence workshop designed to assist us to collectively identify and invent the anticipatory assumptions⁵ that at once enable us to imagine the future and make choices in the present. Our conversation has been contextually specific, not only because we were a distinctive group of people, meeting in a particular place and at given moment in time, but also because from a wide range of perspectives the idea and practice of science is evolving.

Evidence of creative and experimental developments in the theory and practice of science can be seen in a wide range of activities, from the recent World Social Science Report⁶, that addresses the relationship of humanity to a changing global environment, to recent discussions of “sustainability science”⁷. Movement towards new forms and relationships of knowledge creation, spanning efforts to redesign societal innovation systems and embrace unknowability, are altering, reconfiguring and inventing new ways of thinking and doing science. All of this points towards the importance of opening up what we imagine to be the future of science as one of the ways to assist with a fuller

⁴ See for instance: <http://undsci.berkeley.edu/article/whatisscience_03> and <<http://en.wikipedia.org/wiki/Science>> and <http://en.wikipedia.org/wiki/Constructivist_epistemology>.

⁵ Anticipatory assumptions cover a range of different elements that enable conscious thought to imagine the future.

⁶ <<http://www.worldsocialscience.org/activities/world-social-science-report/>>.

⁷ <<http://unu.edu/publications/books/sustainability-science-a-multidisciplinary-approach.html#overview>>.

appreciation of the potential of the present. The workshop has been carefully designed to achieve this objective⁸.

Participants included representatives from government, industry, academy and youth. They were divided into four working groups, each with a facilitator and an observer whose role was to back up the facilitator, support organising the group discussions into post-its and/or flip charts, and to take notes on the process and its main results. The role of facilitators was to simply moderate the process. Hence, the objective was to ensure a systematic and systemic interaction and co-participation between participants in the collective knowledge creation process. A research protocol and general guidelines were developed to guarantee the intended interaction. The objective was not to intervene in the content generation but to merely guide, observe and take notes of the results. For the concrete dynamic of cognitive awareness, main activities and procedures of design thinking were adapted and applied in the three phases of workshop.

In spite of having similar guidelines on how to operate in each of the three main workshop phases, all working groups had the freedom and flexibility to adapt to the group dynamics since the idea was to experiment with different moderation approaches and test what might work best for each context. The similar guidelines were the following:

Phase 1 – expectations (predictions) and desires (hopes): groups would work with a timeline looking at 2040. Participants would have a few minutes individually to write down on post-its their main ideas for their expected and desired futures. These would then be shared with the group and discussed. Groups would have to find a way to organise both their expected and desired futures into two respective narratives. To facilitate the organisation of participants' inputs and, later on, the presentation of their two narratives to the wider group, one possibility was to use the four main layers of the Casual Layered Analysis method: i) a headline message (phrase), ii) the way in which systems operate (e.g. economic, environmental, social, technological, political, etc.), iii) the way in which specific actors operate and/or behave, and iv) a metaphor that would represent the narrative.

Phase 2 – reframed future: a reframing “disruptive model – Learning Intensive Society (LIS)⁹ – was introduced to participants and its key attributes highlighted. The primary task in this session was to engage in “rigorous” imagining exercise using the analytical model of the LIS provided for this purpose in order to create multi-dimensional, multi-layered descriptions of a snapshot of the future. In this model major aspects of the image

8 See workshop agenda in Annex 3.

9 See Annex 4



of the future are fundamentally different than in the present. Hence, this time it was definitely not about prediction, probability or preference. Rather the aim was to describe in operational terms how things work in this imaginary societal system, the position and functioning of science in this discontinuously different future. Again, the idea was to avoid discussing dynamics or how this happened. The goal was to describe in as much operational and “day-in-the-life” detail what it is like to live in this LIS and what is the nature and role of science in this imaginary society.

Phase 3 – using the future to expand our understanding of the present: groups would either identify an operational “problem” in the present (e.g. IPR or peer review that define quality of research) or depart from a few questions that they thought became relevant to be analysed and operationalized in the LIS after going through Phases 1 and 2. Either way, groups would have to discuss the ways in which these “problems” would be dealt with, or questions would be answered within their narratives of the LIS. At the end of the process groups would need to revisit their discussions in order to identify new questions, especially those which might have been considered unimportant or incomprehensible without going through Phases 1 to 3.

First Phase

The main objective was to build temporal and situational awareness. Self-awareness is related to experience. For pedagogical purposes the design placed these experiences in a frame through shifting both expectations/predictions and values/hopes from tacit to explicit. This took place via a facilitated group discussion about the future of science in society in 2040.

Before the kick-off of the working group discussions, participants had just quickly introduced themselves. Hence, at this point, working groups are placing most energy in the search for orientation and in getting to know each other. This happens in most group processes, and one of the more relevant aspects are those related to acceptance (inclusion/exclusion), reliability, and rules. These have all been considered when designing the group work.

Group one used post-its in cool colours (blue and green) for the expected futures and in warm colours (pink and orange) for preferred or desired futures, called hopes and dreams. After brief introductions, the participants were asked to write their expectations for the future of science in 2040, one per post-it. The group reviewed each member’s ideas, grouping them into major categories. Positives were arranged on one side of the poster pages and negatives were set to the other side. Some anticipated changes had both positive and negative aspects. For instance, more open access to data might produce innovations and also new security and privacy risks. In the second segment

on desired futures (hopes and dreams for 2040), they took the positives from their expectations and built on them, which they called “new frontiers” for science. Education, health, environment, and technological breakthroughs would open opportunities. In terms of risks such as military and cybersecurity, they explored solutions and contingencies for overcoming possible problems. Using the posters, a spokesperson was designated to present the group’s ideas in the plenary session. In this phase, the work and results were quite rational. They did not find it too much surprising, thrilling, or shocking. Their imaginations were engaged and they built well on each other’s ideas, having fun, learning together, showing respect, and playing along. Participants were challenged by the facilitator to think beyond an extrapolation of “business as usual”, noting concerns with progress and growth paradigms, which made them build more “negative” outcomes and contingencies but not radically different scenarios. They looked backward and agreed that the future is not the present only more, but remained rational. They were well versed in trans-humanism, singularity, environmental issues, and other technological futures, so without planting ideas, it was more of a recording what they thought was likely (which changed substantially by Phase 3).

The first task for the second group was to work individually. Participants were asked to write down on post-its four to five short notes (newspaper headlines), which captured their future expectations related to the roles of science in society in 2040. Participants had around 10-15 min for the individual work. Next, they were asked to share their ideas with the group in a sort of brainstorming (uncritically collaboration technique). The CLA method was then presented as a tool to organise and synthesize their notes into four interrelated layers: i) typical newspaper highlight (seen by all); ii) actors in their system (systemic level); iii) attributes of the system (deep values/beliefs aspects expressed in institutions); and iv) myths/metaphors deeper dimension. The group was encouraged and guided through a creative and collaborative process around the ‘building up’ of ideas. Individuals were requested to stand and work together using a flipchart to organise their expectations with the four layers approach. Finally they had to build a synthesis combining their separate ideas into a coherent common narrative. The same process was used for their desired future. The interaction of the group was fluent. After setting up the instructions, there was not much further clarification necessary. For the sake of motivation, it was pointed out several times that they were doing a very good job in order to encourage participants to feel that they were not ‘wrong’, thus embracing any ‘failure’ experience as part of the collective knowledge creation process. At the same time, the main objective was not to reach consensus, but rather to encourage both divergent and convergent thinking. Hence, it is important to highlight differences (if there are any) instead of outlining only commonalities in the collaborative co-creation process.



The third group kicked off with participants writing down on post-its elements related to their expected future in 2040 in one colour and issues related to their desired future in 2040 in another colour. After around 15-20 minutes working individually, participants started reading to the group their ideas for the roles of science in society in their expected/ predicted future in 2040. Afterwards, the same was done for their desired future in 2040. After a round of individuals reading to the group and questions for clarifications, all post-its were collated in the flip charts, one for the expected/ predicted future and another for the desired future. The facilitator then asked participants to identify similar messages and to cluster the post-its, initially for the predicted/expected future. Once this was over, the facilitator asked participants to revisit the clusters and to define a headline message for their predicted future. This discussion took a while until participants could reach a consensus on the headline message for their expected future. As soon as consensus was reached the facilitator subdivided the group into 3 smaller groups, each one dealing with one aspect of the narrative using the CLA components: systems operation, actors behaviour and metaphor. The completion of the expected or predicted narrative for the future role of science in society in 2040 took almost all the time devoted for Phase 1. With 30 minutes left, however, it was possible to jointly define a new headline message for the group's desired future, to subdivide again participants into smaller groups to work on systems operation, actors behaviour and metaphor, and to put all together to be presented for the wider group.

Group four decided to organise the process more openly and asked participants to initially write down on post-its elements related to their expected future in 2040. These were then presented by each individual to the whole group and discussed. After going around the table the facilitator and the observer supported the participants to cluster their ideas through brainstorming. The second half of the time was devoted to a similar process looking at participant's desired future in 2040. Both narratives were presented to the wider group by explaining their clusters in their expected and desired futures.

In terms of results of Phase 1 these are presented together as all four groups had similar or complimentary ideas of the predicted and desired future roles of science in society. In Phases 2 and 3, however, groups come out with diverse outcomes. Hence, these are presented in a different way in Phases 2 and 3.

The main results of Phase 1 for all four groups joined in terms of overall assumptions regarding participants' expectations and desires related to the future roles of science in society can be summarised as follows:

- 1) Science as technology fix – the main attributes being:
 - Biotechnology and ICT being pervasive to all realms of society;
 - Clean energy (e.g. nuclear fusion) becomes affordable (cheaper) to all as it does health systems (cancer solved; nano, genetic and bionic medicine, etc.), water and all other means necessary for societies' quality of life;
 - Science able to address all global challenges (the reach of a sustainable world with the Millennium goals achieved and businesses competing for remaining garbage) and to bring about greater social justice, as well as to enable global peace and quality of life through new innovations (STI breakthroughs), knowledge at new frontiers and unknown technologies;
 - STI controlling nature leading to a bridge between machines, humans and nature;
 - Extension of human life through reengineering of cells and genetic enhancements;
 - First child born in space and ability to travel to neighbourhood galaxies;
 - More productivity, efficiency and access to services.
- 2) Science/knowledge empowering individuals and societies – the main attributes being:
 - Integration between science and society leads to empowerment of citizens and democracy;
 - Science becomes international, transdisciplinary and collaborative, and is embedded in education early on (beyond existing disciplines) with equal access and opportunities for all;
 - Science serving and responding to social needs as well as an input to policy and decision making (policy informed by scientific evidence with political systems accountable to scientific decisions and public judgement/outreach);
 - Gender equality and balance as well as recognition making scientific career of greater interest (considering youth needs and expectations) and leveraging overall investments in research (EU applies 5% of GDP on R&D investments);
 - Citizens become more informed and conscious making better decisions individually and collectively (thinking globally, acting locally); all citizens are scientific literate;
 - Scientific method pervasive to individuals in their daily life and at all educational levels bringing about a new kind of spirituality, with new values an ethics (no more science for war), as well as leading to both admiration and fear for science and its achievements
 - Human and social values become means of exchange, and diversity becomes the main driver for innovation;
 - Borderless world governance and increased communication, with less corporations and more networks globally leading to open and free access to/share of knowledge;



- Conflict between marketing vs. government (regulators) as driving scientific developments – either way there are risks of manipulation to overcome due to hidden agendas;
- Conflict between indigenous and scientific knowledge remains unsolved as it does cyber terrorism;
- Big brother as STI controls data and information of all individuals.

Figure 2 below illustrates the main results of Phase 1. Annex 5 explains the illustration in detail.



Rafael Benjamin da Silva

Figure 2. Illustration of Expected and Desired Future Roles of Science in Society

Second Phase

This Phase proposes a reframing exercise through a rigorous imagining which involves two distinct challenges: imagination to push the boundaries and rigour using a systematic creative procedure. The technique asks for a detailed description of particular future aspects in an imaginary society using a disruptive tool provided for this purpose.

In the beginning of the second Phase the Learning Intensive Society (LIS – Annex 4) was introduced – it is a model that significantly alters the way society functions and the nature and role of knowledge production in general and science in particular. In short, it is a transformative future scenario, non-linear, non-determinate complex society with democratized knowledge and co-created innovations. Institutions are no longer effective, learning and knowledge are developed in public and by the public. The hierarchical organizational model yields to heterarchies of free agents.

After the presentation highlighting what participants were required to do, they were initially asked to read through the workbook provided (Annex 4). Participants then debated the qualities of the documents: “too long, too obtuse, and difficult to read; get an editor”. Even if the questions that participants would need to discuss and answer within their groups were spread in the workbook (Annex 4, pages 2 and 6), it took some time to define the starting point of the discussion, especially for groups one and four. Group four was in fact stuck on how to kick-off the discussion and asked the observer of group three to support and facilitate the debate.

In this context, group one initially gave an “anarchical” label to LIS outlining it was “too liberal, too progressive”. Soon after the group determined collectively that a new reputation process could replace some of the current institutional barriers eventually working beyond the objections. They likened it to a clearly defined, open-edge network. Networks were seen more like mountain peaks and valleys with concentrations of high activity among otherwise a flat landscape. Exploring this potential they soon had a facebook-like network for science where access and players were continually evolving, reputations developed based on peer-acknowledged contributions, and co-creating innovations. Participants imagined a new work/life described as “productive leisure”. While they would perhaps enjoy more free time, they would never be completely away from work due to mobile interconnectivity. Under the rubric of “uncertainties”, data would be open to all for both access and input, so subject to malicious meddling. Ethics would be impossible to manage due to different sensibilities and a lack of responsibility among amateurs: “not everybody is good” was a comment from one scientist referring that ethics could be difficult to control in an open shared new system. In what the group defined as a “new frontier” scenario, qualifications and resources faced unknown pressures and need new systems for continuous sorting. New avenues and new



players would be constants, which is in effect, saying that change is constant. Finally, the metaphor “open Olympics in science” explains the scenario where it would be possible to pick up outstanding persons at an early age and/or in isolated places.

The second group used a chart of double framing Synergy Conditions for Transition Scale Change to help identify different dynamisms (Technological, Economic, Social, Governance, etc). Participants had 10 minutes to read the workbook provided. The same routine as in Phase 1 was followed: 10-15 minutes for working individually writing down their ideas. These were then shared within the group and jointly analysed. Collectively participants expressed their initial ideas into two or three words each and created new ones identifying drivers and dynamics of change using the chart provided. It was a spontaneous dynamics, with no one leading it. Participants were active and rotated in taking the lead naturally. In the beginning the interaction seemed a bit ‘chaotic’ and at times participants were feeling they were sort of ‘lost in translation’; but they persevered in sharing and discussing their ideas. Eventually, in the last minutes of the discussion a configuration emerged with a common and meaningful sense. It was an ‘aha’ moment. It felt very emotional and they expressed their happiness by sharing their story with the wider group in plenary singing it in a rap style. It is important to point out that a few divergences did appear in the process. An example of how to handle these was when one of the participants was in total disagreement with the meaning of the Universal Innovation Society and the way it was presented in the graphic in contrast with Industrial Era (workbook in Annex 4). The facilitator welcomed the different point of view and asked participants to rewrite these. The group agreed and co-created a new Learning Intensive Society, which they called the ‘Creative Society’. From this starting point, the group was able to continue with the task required focusing their energy in a proactive and constructive way instead of trying to defend themselves, or to convince others of own ideas. In short, their scenario was called Creative Society, Science and Arts – Bridging the Gap: Scientific Culture, Artistic Culture. It included the following aspects: activities organised for life; flexible networks; interchange of knowledge; zero material differences; open clusters; cooperative work; cognitive capability identity; no money but human values; no corps. Science appears associated to spirituality and education: Spirituality, Education & Science. Social dynamism is based on freedom and the capacity of ethical responsibility; exchange of relations is flexible; new Universal Rights also for living and non-living (human, animal, plants, no-human); no need for gender issues. About governance dynamism some of the highlights were: individual values based on social contribution, culture of individual & collective rights; no state, only alliances; open data for government participation. Finally, it is important to point out that fun was an important driver and objective at the same time.

The third group entered into a very energetic discussion about the specificities of the LIS model and requested more information about it. Nevertheless, the workflow improved significantly compared

to the first Phase and the participants cooperated efficiently thanks to a shared model framework of the LIS, which replaced some of the key controversial assumptions. It was also much easier for the group members to come up with systemic propositions of reforms for a better science within the LIS framework, including specific, rigorous proposals of building less formal, more project oriented, international teams made of individual researches and sponsors of research thanks to technology-enhanced networks of research cooperation. One particularly interesting feature of this proposition was to move from using universities and institutes as brokers to facilitating ad hoc networks of scientists and financing institutions. Still, threats for the scientific community in terms of their prestige and social status were communicated and a certain sense of ambiguity about the educational priorities to be redefined in the future indicated hesitation about the change in the status quo that would stem from a potential future expansion of LIS in the real world. One also needs to take note of the belief, expressed by the participants, that the LIS is, at least to a certain extent, and in given aspects of the model, already in place. So there is a risk that the group anxieties, especially those stressed by the representatives of government tacitly or explicitly, reflect in results that are mere extrapolations of currently detected phenomena. However, the metaphor chosen by the group, one of crossing the mirror and following the white rabbit, clearly indicated the exploratory conscience of the group in the reframing phase.

The forth group kicked off the debate with the (new) facilitator re-introducing the main attributes of the Learning Intensive Society after all participants had finished reading the workbook provided. The facilitator asked then participants to take a few minutes to reflect upon it and write down how they believe such a reality would look like. It is important to mention that participants were asked to refrain from looking at a specific point in time (i.e. 2040) and to simply look at the LIS as a reality in the future. A brainstorming was then initiated. The facilitator asked the first participant to share his initial ideas and soon all participants got excited to either contribute to the novel and disruptive ideas being introduced or to go against it by anchoring their ideas in the present. The facilitator was simply trying to guide participants so that they would refrain from any constraints anchored in the present in order to think freely and wildly. A consensus was not fully achieved at the end but ultimately a scenario was developed collectively. This was presented in plenary mixing story-telling (one of the participants started to tell the narrative as a poem, a dream) and an explanation of the process undertaken by the group. The scenario included the following aspects. Humans would be able to connect to their inner voice and to nature. There would be no expectations on what needs to be done as reality unfolds with no need for control. Everything would be interconnected, so what materialises is exactly what would need to materialise at that particular moment in time. Physical spaces would be designed for multiple purposes and uses, and communications would happen on the go with whomever a person wants or need to via telepathy or an avatar. Technology would be pervasive and embedded, interconnecting everything (i.e. ambient intelligence). There would be no



need for life in biological terms as there would be many forms of being alive with no waste of energy in connecting people and things. A repository of thoughts and emotions in a sort of cloud connected to everything would allow people to refrain from remembering things as all knowledge would be automatically accessible to anyone at anytime. Individuals would be able to live the present since there would exist no attachment to past or future. Everyone would be immortal since mind, thoughts and emotions would somehow survive forever in the cloud. Hence, a physical or material space as well as body would not be a constraint. Systems would be flexible, able to self-organise and self-govern (no central control or organisation) according to the needs of the moment. Thus, physical systems would manifest as other systems self-organise and everything would be embedded with intelligence. The human body would exist for leisure, experimentation and dreaming; dreams which would be automatically prototyped in personal printers and then produced in a customised way for each individual (unique creation). In this context, identity would be defined both by history and interactions with one another and with the environment in the present. Good or bad would cease to exist as experimentation and interactions becomes the only important thing. Ethics would be embedded in each and everyone since we would only exist in interaction with the system and others, which brings to the fore mutual respect, trust and appreciation. Wealth would be measured by creativity in interaction, which would lead to unique creation.

In terms of overall assumptions of Phase 2, these can be summarised as follows:

- 1) Networked life and science with embedded technology – the main attributes being:
 - Spontaneous innovation co-created in interaction and unique creation linked to creativity in interaction and to individual customisation of any produce stemming automatically from individuals' dreams;
 - Productive leisure linked to continual work, experimentation and dreams that become physical reality at any given moment and are designed for multiple purposes and needs;
 - Seamless communication with no waste of energy and with knowledge automatically accessible to anyone at anytime;
 - Life beyond biology with repository of minds, thoughts and emotions.
- 2) Self-organised and self-governing systems – the main attributes being:
 - Change is constant, life and science are complex, and systems are flexible, able to self-organise and self-govern (no central control or organisation) according to the needs of the moment;
 - No control of ethics which becomes embedded in every interaction and brings to the fore mutual respect, trust and appreciation, and lead to peer-acknowledge contributions and reputation.

Figure 3 below illustrates the main results of Phase 2. Annex 6 explains the illustration in detail.



Figure 3. Illustration of the Roles of Science in the Learning Intensive Society



Third Phase

Phase 3 is the 'natural' conclusion of the process. The aim is to allow participants to appropriate themselves from the overall experience and learning process.

Generally speaking, groups departed from either an operational "problem" in the present to understand the ways in which this would be operationalized in the LIS scenario developed or from a few questions which became relevant only after going through Phases 1 and 2 and that had to be analysed in the LIS scenario developed.

Group one started with the proposition: you started with your expected and desired futures. Then you were presented with LIS. Has your thinking about the future changed from the first to the second Phase? If so, how? In what ways? Participants varied in their responses, not a consensus. While some were ready to explore a brave new world, others began calculating how to hold back the tide. Still others wanted to create a different new future, perhaps more radical than the LIS. Notably, after deliberation and reflection, some participants who were resistant to the new scenario realised that many ideas of the LIS were already in practice in the present. For instance, democratized knowledge and heterarchies are already occurring via crowdfunding, participative budgets, and so on. As a group of experts, the switch from a discipline of control to an environment of open knowledge presented a threat to the scientists' role and identity, their way of working, and even their belief systems. In other words, they already saw the present differently based on this alternative future. It was critical that the new scenario was one not previously considered, not among the "expected" or "desired" futures, and which would radically change their work. Finally, rather than designating one or two presenters in the plenary, all six members of the group spoke about outcomes and experience. They discussed the opportunities and responsibilities for future generations, individualized laboratory and access systems to resources, new avenues and new images, and working as entrepreneurs P2P rather than at jobs in organizations. By the end, several questions were raised, such as "What would be worse [for scientists] than LIS?" (Response: a totalitarian state; no intellectual freedom). Scientists could grow beyond research, innovation, and education to more public functions as diplomats and change agents. In sum, they moved from exploring content in Phase 1, and external abstraction, to living the future in Phase 3: "How will this future affect me; what do I think about it; and what will I do about it?"

Group two used the flipchart panels from the two previous sessions as mirrors that reflected the shift between these two Phases. The facilitator pushed them further asking participants to explain the ways in which the society imagined in Phase two would be operationalized. It was a creative phase

and to make it more tangible they had to prototype it in some way. Participants chose to do so as a short documentary showing through images the evolution of life on earth: a self-organised world with no central power and with flexible organisation. Participants made explicit their assumptions: complete capillarity; complete personalization; complete freedom. The core ideas were: no nations; no boundaries; universal respect for human and non-human values; the whole-net (instead of internet). A flexible society. Instead of the philosophy of 'use it and throw it away' they proposed 'pick and use it': shared goods; shared transportation; shared housing, through sharing platforms. This is a society of freelancing where the most common job type they imagined would be platforms to share completeness. They realised the need to reframe human behaviour (change of mindsets) towards a society functioning in networks. Also they proposed reframing the nature and the role of science (including social sciences) into a knowledge and cultural creative activity.

The third group engaged in a discussion around the fundamentals of defining scientific method and the profession of a scientist, and some assumptions from Phases one and two were also revisited. This time, not only ideas internal to the group were circulated and debated, but also the ones that were presented by the other groups in the previous Phases. The subject of interface between industry and science was also vividly discussed before the group could agree on a common vision of how the corporate world responds to global challenges and encourages/discourages innovation. Crowdsourcing and sci-sourcing proved to be important axes of discussion about the changing conditions of scientific research and the redefinition of research vocation. Peer-review models were also challenged in the discussion, but the group reached no consensus on different possibilities of transcending the current paradigm, even though its shortcomings related to tectonic shifts in science/society relation were appreciated (e.g. the unprecedented growth in numbers of the research community – 100s of millions of scientists around the world were pointed out). Unexpected outlier results were also presented, such as one of the participants representing a governmental institution suggesting they would design and experiment implementing a participatory budgeting project for research financing, which was inspired by the workshop.

Group four started the debate by identifying questions that apparently had no relevance before going through Phases 1 and 2. These were: i) what and who is a scientist?; ii) how science is performed?; iii) how is science evaluated or how to ensure quality?; and iv) how is science and its results communicated and to whom? The group then debated these questions and tried to find answers in the LIS scenario developed. It is interesting to highlight that the group was pretty much divided with half of the participants trying to look for answers anchored in the present and in what they felt comfortable with. The facilitator was always trying to push participants to look at the LIS scenario developed to find answers instead of looking at the present. One of the participants even mentioned that "we should be open and able to embrace our fears and resistance and to look deeper



into it in order to break from our current constraints". After a good deal of debate, with the group still divided into those "living at the LIS scenario developed" and those "anchored in the present", the facilitator stopped the discussion a few minutes before groups had to report back in plenary. At that point participants were asked to look back at the whole process (Phases 1 to 3) and to once again identify questions that might have been considered unimportant or incomprehensible at the beginning of the workshop, and that now they thought would be relevant if they were asked to look at the future role of science in society today. Participants had only five minutes for individual reflection and soon after new questions started popping up: i) how to democratise science?; ii) how to evolve from a diploma to a capability-based system?; iii) will the educational system as we know it survive?; iv) how to include informal learning into the current or a new system?; v) in which way continual education will be provided and available to all and at any age?; vi) is there a need and choice for different or parallel evaluation systems?; and vii) what will be the role and con tion of government and countries to ensure free access and use of information?

Figure 4 below illustrates the main results of Phase 3. Annex 7 explains the illustration in detail.



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Figure 4. Illustration of New Posed Questions

A different approach to Phase 3

The workshop “Imagine the Future of Science in Society” which took place in Rio de Janeiro on 28 and 29 November 2013 as a satellite event of the World Science Forum for one and a half days was previously tested on July 11 and 12 at CGEE headquarters in Brasilia.

The July workshop, also co-organised by CGEE and Unesco, was the first Futures Literacy Unesco Knowledge Lab (FL Uknowlab) or Local Scoping Exercise (LSE). This was done as a testbed for the main workshop in November, but also for other LSE. Thirty participants were invited amongst scientists, business and government representatives, foresight practitioners and representatives from different religious groups. These were divided into five different groups, each with one facilitator and one observer who were supporting the facilitator. Four groups were discussing in Portuguese and one in English. The plenary report back was done in both languages and there was a direct translation service supporting the process. Three out of five facilitators (two from CGEE and one from Uruguay) also acted as facilitators in the November main workshop.

For Phases 1 and 2 the July workshop worked pretty much like the November event, with groups discussing their predicted and desired future roles of science in society in 2040 initially. Later the groups debated and created a snapshot of the future based upon the Learning Intensive Society (LIS) model presented. The main difference is that in July all five groups used the Casual Layered Analysis method to report back in plenary their narratives for both Phases 1 and 2: i) a headline message (phrase), ii) the way in which systems operate (e.g. economic, environmental, social, technological, political, etc.), iii) the way in which specific actors operate and/or behave, and iv) a metaphor that would represent the narrative.

However, Phase 3 used a different approach in July. Instead of testing new questions and identifying choices, participants were asked to compare their snapshot scenarios in Phases 1 and 2 calling these the “Industrial Era” and “LIS” respectively. Also, they were required to prepare an exhibition to present these different realities. They had to select not only the format of the exhibition (for instance, thinking in terms of a science museum in the future), but also their audience. Finally, the world café approach was employed to allow all participants to talk to one another and contribute to all exhibitions being developed.

As one example, Figures 6 and 8 below depict the results of one of the exhibitions (five were developed by all participants). In this example the focus was on spirituality. The exhibition is an app on any smartphone that reaches out to everyone globally.



The Industrial Era is represented by an app with a “dot” (the world “dot.com”). Users when clicking the app open up different images, each representing a different religion, according to Figure 5.

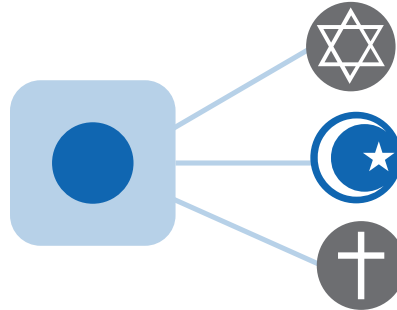


Figure 5. Industrial Era app

By selecting one or another image/religion users are guided to the history of that religion, its main followers and their beliefs, its main rituals, etc. The main attributes of the Industrial Era are:

- Duality between science (as objective) and religion (as subjective) and between continuity and impermanence;
- Religion tries to build a bridge to science, however the gap is widening;
- The main focus is on the “having” instead of the “being” as well as on acceptance, lack of questioning and continuity;
- God is seen as something untouchable and far to reach out, as the all mighty which is disconnected from human beings that have no power over their destiny.



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Figure 6. Illustration of the Industrial Era

Likewise, the LIS is represented by an app with both an “exclamation” and an “interrogation”, according to

Figure 7.



Figure 7. Learning Intensive Society app

Users when clicking the app open up possibilities for interaction (both with oneself and with others) as well as to mutual recognition and acceptance. The main attributes of the LIS are:

- Integration of science and religion which leads to a lack of duality between continuity and impermanence, as well as the embracement of uncertainty and complexity and the acceptance of birth and death, of dynamic and impermanent systems;
- Focus on “being” rather than on “having”, on the sublime, the enchantment and on questioning; the sublime and enchanted materialises both internally and in interaction with others;
- Divinity is internal, inside each and everyone;
- Role of technology is to enable one to connect to its internal divinity and to others since humans only exist in interaction with others, which then enables mutual respect and appreciation as well as the embracement of diversity;
- Language and interaction become key in the LIS.



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Figure 8. Illustration of the Learning Intensive Society



Lessons Learned and Recommendations

The experience gained in the November workshop “Imagine the Future of Science in Society” but also in July (i.e. box 1) highlight that diversity in terms of participation is essential. This is true for unlocking creativity as well as to expand participants’ assumptions and understanding of the system under analysis in the present by using the future. Hence, it is necessary to go beyond the usual suspects of government, business and academia stakeholders to include youth, religious and other groups. At the same time the glue that connects participants into an open dialogue were trust and connectivity is developed along the process is the theme or system under consideration. Therefore, there should be some relation (professional or otherwise) between those participating in the workshop and the issue being explored.

For Phase 1, some groups worked towards documenting their ideas coming in as a baseline, not future ideas that were made more explicit through Casual Layered Analysis (CLA). Other groups did use CLA, discussing, for example, metaphors and images. Since all the groups came to similar conclusions in Phase 1, perhaps either way works, especially if the objective is to make explicit participants’ views as they arrived, with prompts from the facilitator to think more deeply, widely, and further out, but with no new specialized information provided. Then after Phase 2 and LIS, participants would see their prior views in a new light. Hence an important question is related to how much intervention would one want in Phase 1. However, based on the experience gained at both the July (i.e. box 1) and November workshops, the CLA perspective would clearly be useful in both Phases, as a framework or approach more than a rigorous method, just as, for example, STEEP(V) and futures diagrams/wheels can help people think more broadly and longer term. Hence, it may be important to hold the CLA method as a constant in both Phases 1 and 2, so that the content (LIS scenario) would be the variable. It seems, therefore, important to clarify what you learn, and your preferences and intentions for each Phase.

The CLA method showed to be a powerful tool also for organising and reporting back group narratives in plenary for discussion. Nevertheless, having some groups using the four basic layers of the CLA and others not, as happened in the November workshop on Phase 1, can be a source of disruption and competition between groups or, depending on the group composition, give the impression that certain groups have more to loose so that they may not want to let go so easily. Again, clear guidelines naming the overall concept for each Phase and with a step-by-step of what shall be done in each Phase introduced in plenary is key for creating a good working environment

amongst groups as well as for organising the overall workshop results, rather than leaving the decision of process to each facilitator. Ultimately, the experience showed that asking participants to organise their initial ideas in terms of the four CLA layers right at the beginning (after a few minutes just writing down their thoughts) and before sharing these within the working groups for discussion, clarification and collective shaping of both desired and expected futures is the best way to structure and communicate their narratives.

It seems, however, that the CLA method is an important tool mostly in Phase 1. In Phase 2 an imaginative process seems more appropriate, and different dynamics, which allow creativity to sparkle within groups, should be experimented, such as role-play, storytelling and the use of different media to report back the results of the group's discussion. Ultimately, beyond increasing creativity this makes the event much more pleasant and less tiring. In this regard, the November workshop also highlighted that individual performance in reporting back the group work in plenary makes a great deal of difference. Thus, either having facilitators/observers with such a capability, or experimenting with different dynamics for group individuals would be important. It is perhaps interesting to highlight that even not using the CLA layers to organise the results of the group discussions and to structure the reporting back in Phase 2, it may still be valid to use the CLA layers of "systems" and "actors" to include diversity and different colours in the scenario, to deepen its description and/or to allow different participants to play with different systems and actors (e.g. role-play).

It was also highlighted as an important aspect of the dynamics to encourage participants to feel that they were not 'wrong', therefore embracing any 'failure' experience as part of the collective knowledge creation process. At the same time, the main objective should not be reaching consensus, but rather to encourage both divergent and convergent thinking. Hence, it is important to highlight differences (if there are any) instead of outlining only commonalities in the collaborative co-creation process.

The lack of clarity on how to kick-off the discussions in Phase 2, however, was a source of problem in the November workshop: for instance, the observer of group 3 became facilitator of group 4 and, again, different groups experimented with slightly different approaches. Ultimately, clear guidelines with simple instructions, not a script, and expected outcomes in each Phase introduced in plenary before each breakout group discussion becomes key across the process. We would then discuss intentions and expectations quickly and go to work. This is true even if facilitators have rehearsed the agenda before each workshop day, as was the case, which is also an important element for building coherence and confidence on the process. Therefore, for the facilitators a few key expectations for each Phase segment, very simply stated (i.e. questions that should be addressed/ answered), becomes crucial. Finally, giving participants material (LIS) to read during the workshop should be avoided or edited in



a way that makes the group work more effectively by knowing what is expected and the process that should be followed to get there. In any case, workshop dynamics for each Phase must be clear in the plenary before each breakout group discussion and reading material with background information should be given either before the workshop or at the end as a remainder for future reading, as a take home. The before and after communications matter as much as the event.

In Phase 3, it is interesting to highlight, for instance, that after all four groups presented their results in plenary, group one thought that the scenarios of the other groups, while intriguing, were less serious than the deliberative work they did. They thought that debating the merits first was a more responsible process. In other words, in Phase 2 they tested the value of the transformative scenario before they accepted it as viable or even as a useful thought experiment, much like testing a hypothesis. However, by Phase 3 they reached a plateau in the debate and became more open to exploring future possibilities. Some participants perhaps begrudgingly moved forward and others embraced the possibilities and began reshaping the LIS scenario and imagining new more radical futures. Consequently, a little more time (say another half-day session) would be needed if a group wants to explore both sides of the issue. Overall, participants left wanting to stay connected and do more foresight work about their field. “What’s next?” “Where do we go from here?” They did not see this session as an end or stand-alone event, but as a beginning. They asked: “What will it be like to work beyond our comfort zone every day?” “What new capacities will we need and will we develop?” “What new uncertainties?” “Where do we see signs of transformative futures today?” “How will this future affect me; what do I think about it; and what will I do about it?”

Another element that was raised in some groups was the ability of the facilitator in both guiding the discussion and in summarising it. This was key to enable at least one group to quickly revisit the main points raised in their discussion, to reflect upon these and deepen their conversation, and to prepare their reporting back. Perhaps, the role of the observer should become that of summarising the discussions, as it can be quite difficult to find facilitators able to do both things well on the go. In any case, guidelines for observers are also important: should they document, provoke, make comments or what? Observers should, therefore, be part of the early pre-discussion. And both observer and facilitator should have the group list with bios in advance. Overall, it’s a robust process and can accept many different people so long as the expectations are clear: what are you trying to achieve?

It is important to point out that a few resistances may arise in the process and it is advisable to remember what was said about resistance as the confluent pole of change. Hence, when designing similar processes one should do so in a way that it welcomes divergences (inclusion of diversity) and allows participants to be proactive, thus enabling a space for dialogue where

participants can create (imagine) 'the new' as a possible alternative future, which then opens up new opportunities in the present.

In terms of room and logistics, a nice space that enables groups to work in the same room without disturbing one another is important. Also, windows in the room would have benefited creating an environment of creativity and relaxation; natural daylight is important. Food in the room throughout the workshop is good as it enables people to feed themselves as they like without disturbing the workshop. Laptops in every table/group did not seem to be useful, but perhaps they could have been if observers were taking notes. However, apparently flip charts (even two per table) seems to be more important for taking notes that summarises the group discussions and to enable groups to organise their ideas (i.e. clustering them, organising and re-organising for discussion within the group and to report back in plenary). In this regard, the post-its of different colours were also useful to represent different ideas (i.e. desired vs. expected). Also, it may be important to tell facilitators/observers to label the poster sheets by Phase; it helps recall. To sum up, small items that can make a difference include:

- Pens should be felt tips or roller balls, not traditional pens so that the ideas on the post-its are visible from greater distance;
- The PCs on the tables were not necessary, but might be depending on the role of observers;
- On-going food and drink is perfect;
- Tables of a good size matter, which was the case, not too big to inhibit conversation;
- Two flip charts per group were useful;
- Different coloured post-its are also useful (e.g. cool for expectations, warm for hopes and dreams);
- Make sure there are some electrical power outlets for participants nearby tables;
- Use of music was good, so should be other elements that invite relaxation and creativity!

The size of groups and mix worked well; all groups should include varied ages, genders, races, representations and geographies if possible. At the end of the workshop a few minutes to fulfil an evaluation sheet with things that they liked and disliked, and suggestions for improvement, should be provided. A list of participants with email and institutions for networking should be shared, and participants should be invited to include their input/refinements in the workshop report in case one is developed, as has been the case.



As follow up, some sort of process for debriefing or thanking participants must be designed. As Unesco is building a global network of constituents, perhaps the set up of an online network or newsletter informing participants about progress would be important to connect people into an ever growing network around anticipation and the use of the future to expand our understanding of the present.

Finally, in terms of testing further the approach, CGEE is now thinking of designing an internal process to think about the future of the institution or the future of STI systems and how the institution positions itself within such futures. As more time can be devoted for such an internal experiment, possibly the overall process will be opened in ways that initially a few questions on the subject under consideration may be identified collectively, for comparison and discussion at the end of the process. Later, all collaborators should think in terms of expected futures and to articulate these in terms of the CLA layers. The next step would be to repeat the process and think about desired futures, also using CLA. Following, a disruptive model will be provided in a way that all collaborators can imagine different ways in which the institution can operate in such an alternative and disruptive future. Collaborators will then be invited to look at the whole process to: i) identify new questions that may have become strategic and were not considered important or comprehensible at the beginning; and ii) think of different ways in which the process (expected-desired-disruptive futures) could be prototyped and communicated (selecting also the audience beyond formats of the exhibit). Throughout the process and between phases ideas will be clustered and organised by a dedicated group to be refined by all based on different visuals and exhibits that shall be developed with the help of an illustrator. At this point collaborators shall either look at the overall process and/or the assumptions identified in the different phases to articulate their ideas and emotions, but also to think how far similar processes can be used in each individual daily work as well as in the projects being carried out by the institution. Depending on how things evolve, it may also be the case that collaborators think about different strategies and actions that could enable the organisation to operate in such diverse futures, which could then serve as input both to identify what the institution wants to be in the future and in which systems it wants to operate in or even (co)create from scratch (looking outside-out or at unknown systems).

Annex 1 – Futures Literacy

Reducing, managing and overcoming uncertainty is one of the main aims of decision makers, in the public and private sectors. Only, as many today acknowledge, there is a fundamental distinction between risk and uncertainty. The former is a legitimate subject of analysis and of in-depth efforts to reduce and manage; whereas the latter relates to inherently unknowable phenomena. This poses two fundamental questions. First, how can we determine the boundary between risk and uncertainty, how do we assign phenomena into one category or the other (or why-how phenomena may wander across categories)? Second, what can be done about uncertainty other than resigning ourselves to its unknowability? Futures Literacy uses the Discipline of Anticipation to provide a rigorously grounded and creative approach to identifying and inventing anticipatory assumptions in light of emergent repetition and difference.

Futures Literacy provides policy makers with an enhanced capacity to both question and invent the anticipatory assumptions that inform their choices. Participants in a FL Uknowlab acquire this enhanced capacity through a learning-by-doing introduction. The collective intelligence process of a FL Uknowlab reveals and challenges the implicit and explicit anticipatory assumptions use to think about the future. Participants in the FL Uknowlab engage in a simulation that advances their capacity to make strategic decisions in contexts of ambiguity by more fully exploring the potential of the present so that diversity and complexity can serve as sources of inspiration; a way to embrace the dazzling heterogeneity of the world as well as to respect the creative spontaneity of freedom and serendipity.

Futures Literacy (FL) is a systematic approach to improving the capacity of our anticipatory systems. Decision-makers who are futures literate have a more explicit awareness of the expectations and values that shape their (and their community's) view of the future. They are also better able to design collective intelligence processes (knowlabs) that use the future to see opportunities in today's intricate, fluid and spontaneous world.

Developing this capacity joint creation, a shared process of constructing strategic conversations. Futures literate individuals and organizations use rigorous and systematic methods to discover strategic possibilities and build bridges to action

In the past simplification, advanced planning and linear decision making were all highly successful tools for improving efficiency, organising innovation and reducing risk. Now these industrial era tools defeat the learning organisation, wasting knowledge at every step. In marked contrast a futures literate organisation makes full use of the rich sea of information and the direct know-how/know-what of decision makers in all spheres



Annex 2 – Knowledge Creation and Learning Processes

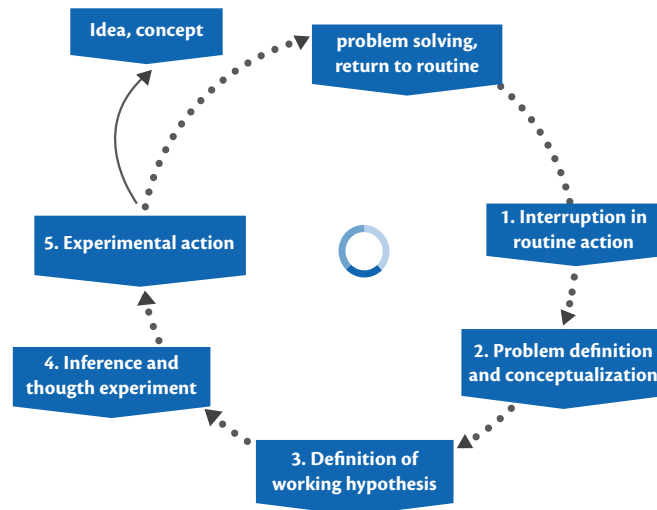


Figure 1. Dewey cycle of learning



Annex 3 – Workshop Agenda

Imagine The Future of Science in Society
A Futures Literacy Unesco Knowledge LAB (FL Uknowlab) and
CGEE Methodology Development (CMD)
Everest Hotel, Ipanema, Rio de Janeiro (Brazil), 28 and 29 november 2013

November 28, 2013

Session 1 | 09:15 - 10:15

Welcome, outline of the purpose of the event and an introduction to the process

Session 2 | 10:15 - 12:15

Phase 1 – Futures Literacy: expectations/predictions, hopes/desires

Session 3 | 12:15 - 13:00

Plenary session – reporting back

Lunch | 13:00 - 14:15

Session 4 | 14:15 - 14:45

Phase 2 – Futures Literacy: Introduction to imagining science and knowledge creation in the Learning-Intensive Society

Session 5 | 14:45 - 15:45

Phase 2 – group work using the workbook

Coffee break | 15:45 - 16:00

Session 6 | 16:00 - 17:00

Report back and open discussion

Session 7 | 17:00 - 18:30

Check-in about what we discussed during the day and tasks for tomorrow

November 29, 2013

Session 8 | 9:00 - 10:30

Phase 3 – Revisiting assumptions and posing new questions

Session 9 | 10:30 - 11:10

Groups present their work to the plenary

Session 10 | 11:10 - 11:30

The Discipline of Anticipation, and the Unesco project on Scoping Global/Local Anticipatory Capacities

Session 11 | 11:30 - 12:30

Open discussion, comments and feedback on the group presentations and overall process

Session 12 | 12:30 - 13:00

Wrap-up overview of the process



Annex 4 – Learning Intensive Society – Phase 2 Workbook

Imagine The Future of Science in Society

A Futures Literacy Unesco Knowledge LAB (FL Uknowlab) and
CGEE Methodology Development (CMD)

Everest Hotel, Ipanema, Rio de Janeiro (Brazil), 28 and 29 november 2013

The aim of this FL Uknowlab¹⁰ is to give participants an opportunity to learn about anticipatory systems, how we use the future, by considering an important topic – the future of science in society. The FL Uknowlab follows a learning curve sequence that is intended to engage the collective intelligence of participants. The idea of collective intelligence is that everyone knows things, not always explicitly or articulately, and that when we make an effort to share meaning we are obliged to clarify and seek shared meaning. Through this conversational process information is revealed, new meanings and even phenomena discovered and shared sense making emerges (which is not the same as consensus or agreement - indeed there can be a clarification of disagreement). Of course this search process is incomplete and biased in many ways but since it is collective it is also more diverse, at a minimum in terms of different points-of-view due to age or gender or personal history, and it offers the potential of making explicit specific, time-place unique, information that the participants carry with them into the conversation. This is why the creation of knowledge through collective knowledge creation processes (or knowlabs) is one of the main ways to “research” the anticipatory assumptions that we use to imagine the future.

“... science is no longer limited to idealized and simplified situations but reflects the complexity of the real world, a science that views us and our creativity as part of a fundamental trend present at all levels of nature.” (Ilya Prigogine, *The End of Certainty: Time, Chaos and the New Laws of Nature*)

“The underlying process that produces both the possibility for true novelty and fundamental unpredictability can be characterized as ontological expansion” (Ilkka Tuomi, *Next Generation Foresight in Anticipatory Organizations*, European Forum on Forward Looking Activities, 2013.)

¹⁰ This FL Uknowlab is an example of the practice of the Discipline of Anticipation. For more information regarding the emergent DoA see for instance: <<http://www.fumee.org>> and Unesco Chair in Anticipatory Systems <<http://www.projectanticipation.org>>

Question Guide for Phase 2 Breakout Group Discussion

Back in breakout groups participants will engage in a facilitated discussion. Once again groups use post-its to create multi-dimensional, multi-layered descriptions of a snapshot of the future – however this time it is definitely not about prediction, probability or preference. Rather the aim is to describe in operational terms how things work in this imaginary societal system, the position and functioning of science in this discontinuously different future. The following workbook offers some suggestions regarding questions to explore and supporting material that describe some conceptual tools for describing the Learning Intensive Society (LIS). The analytical model is meant to help participants imagine “day-in-the-life” differences between today and this imaginary future.

The task in this session is to “reframe”. The “disruptive model” of the Learning Intensive Society (LIS) is not based on either probabilistic or normative reasoning, although there is a set of narrative assumptions used to frame the analytical model (see below). The primary task in this session is to engage in “rigorous” imagining exercise using the analytical model of the LIS provided for this purpose. In this model major aspects of the image of the future are fundamentally different than in the present. Again the idea is to avoid discussing dynamics or how this happened. The goal is to describe in as much operational and “day-in-the-life” detail what it is like to live in this LIS and what is the nature and role of science in this imaginary society.

The following pages provide a few of the key attributes of the LIS model. The diagrams are meant to be tools for describing an imaginary future. Try to live inside this alternate reality as an exercise in reframing. The point is to build up a new set of anticipatory assumptions, ones that can be used subsequently to examine current dominant anticipatory assumptions and then on the basis of the contrast pose some new questions about the present. The aim is not to address the question of how to achieve an LIS future nor consider to what extent such a future is probable or desirable.

Key concepts and descriptors:

- The unique creation economy, a “murmuration” of “banal creativity” – heterarchical and fluid. Characterized by continuous birth, death, entry and exit of value creating networks;
- Change as compositional – as new activities and ways of organizing life emerge the old ways change position in the overall weight of the total activities (time, resources) undertaken in a given society;
- The attributes of identity creation and “value” creation (economic) are different, in the LIS identity emerges more consciously since there has been a change in the conditions of change – people have a greater capacity to recognize their socially constructed identity



and to engage in its continuous internalization/externalization. This enables an expansion of the recognitions, accounting and organization of what has generally been called production or wealth creating activity;

- Decision making capacity – the LIS is an “experimentalist” society where conducting experiments is a way of life and learning from both failure and success essential;
- Administration is marginal and responsibility is taken where and when something happens;
- Transformation, as always, is multi-dimensional, occurring across inter-dependent systems.

Also: i) look for a metaphor, a title for your scenario; ii) recount a short day-in-the-life perspective; and iii) briefly explain the nature, role and working of systems for using the future.

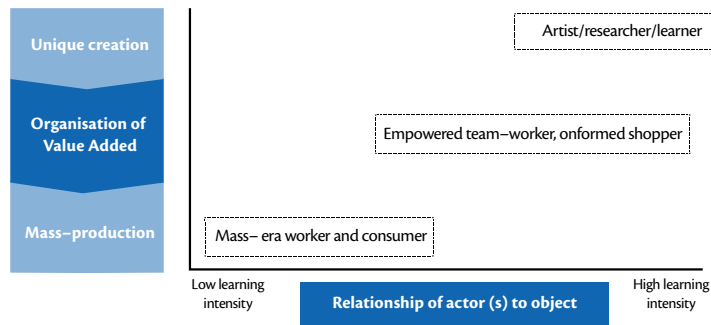


Gráfico 1. Creating wealth - changing sources

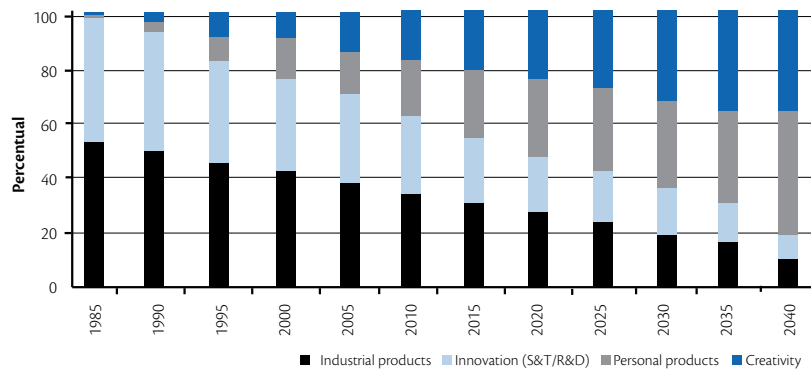


Gráfico 2. Changing composition of output

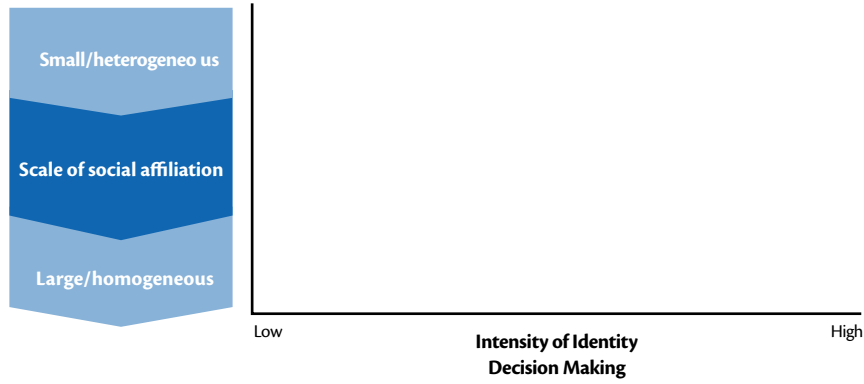


Gráfico 3. Social dynamism – Social identity creation

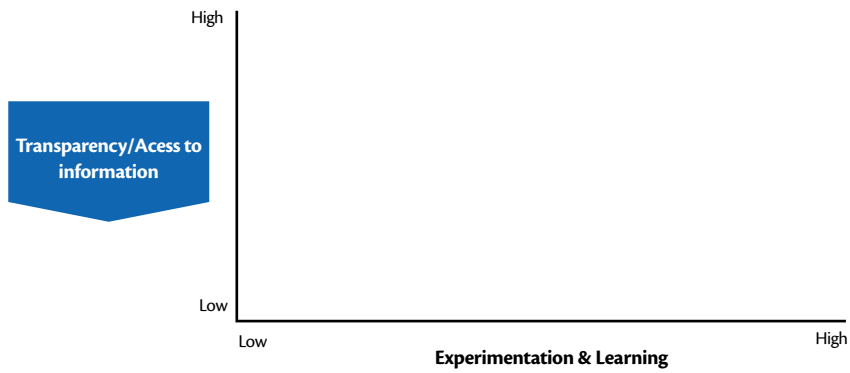
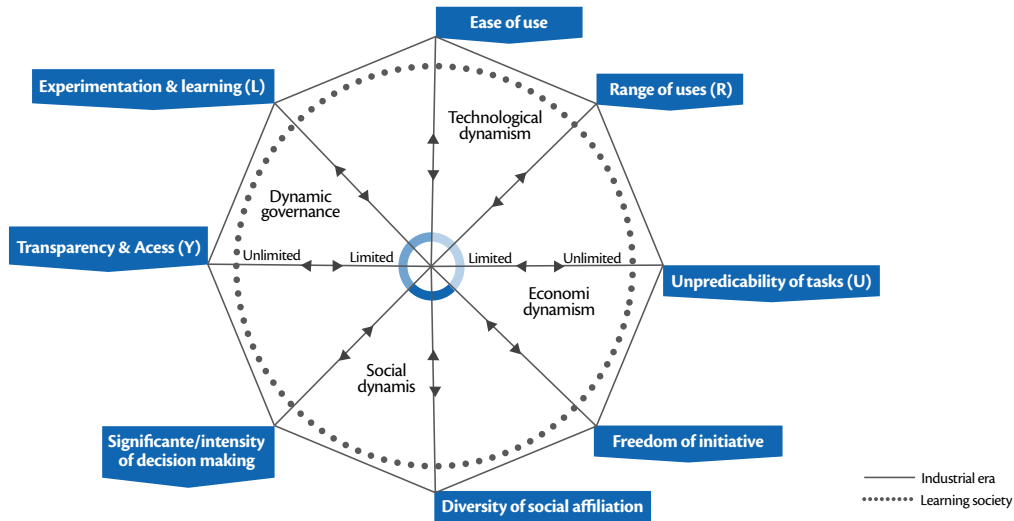


Gráfico 4. Dynamic Governance – Decision making quality



	Industrial Era	Universal Innovation Society
Wealth	Dominated by physical/financial	Dominated by human capital
Rules	Simple property rights	Emergent property rights
Governance	Ex-ante allocation of power	Real-time allocation of power
Values	Adoption of the Universal Declaration of Human Rights	Implementation of the Universal Declaration of Human Rights
Economy	Mass production	Production for self/community
Home	Life organized for work	Work organized for life
Authority	Hierarchy	Hierarchy and heterarchy
Identity	Imposed identity	Co-created identity
Freedom	Liberation from constraints	As a capacity to do things

Narrative frame for the “Universal Innovation Society” story

Purpose: The goal is discovery (search) – to use the future to gain a better understanding of the potential of the present. This is not an optimisation or contingency exercise aimed at planning or preparing for a risky event.

Point-of-view: Change in daily life (metric: agriculture to industry). Not institutional or macro level variables (although obviously the changes in the conduct of daily life have aggregate and institutional implications).

Temporal frame: Comparative static cross-section of a moment in the future – the point is not describing the voyage or how or why to get from A to B.

Protagonist: the actors or “clients” of the knowledge created by this process are decision makers throughout society, from a scientist and senior civil servant to everyday citizens.

Rules: universal declaration of human rights, representative democracy, mixed economies (markets not planning), etc.

The LIS is defined by:

- 1) Ambient computing – high levels of ease-of-use, range-of-uses for information technologies such that these tools are no longer “evident”;
- 2) Unique creation – high levels of unpredictability of tasks and freedom of initiative for wealth creating activity mean that the predominant source of value-added is the refinement of taste (banal creativity);
- 3) Bottom-up collective identity (not individualist/ism) – high levels of diversity of affiliations and intensity of identity generating decision making produce sense making that integrates (internalizes not socializes) the social nature (collective condition) of the personal;
- 4) Governance – high levels of transparency/access to information and experience in making strategic choices emerges reflexively from the interaction of ambient computing, unique creation and bottom-up collective identity.



The descriptive short version: The LIS is about daily life when:

- Infocom is ambient and ubiquitous (e.g. augmented reality), the use not the tool requires skill;
- Unique creation predominates in a high transaction intensity, post-subsistence, quality of life economy;
- Identity is bottom-up, highly heterogeneous, produced endogenously on a Senian capacity to be free minimum common denominator of values; and
- Decision making capacity – balancing open and closed ways of using the future to understand the present – allows people to embrace experimentalism, heterogeneity, complexity and spontaneity.

Some suggestions for discussion in the working groups:

- What is the nature and practice of science in society?
- What is the nature and extent of “research”?
- What kinds of collective “platforms” or “standards” enable “science” and “learning”?
- How is trust established and maintained?
- How is wealth accumulation & exchange organized?
- How is the creation of knowledge organized?
- What kinds of property rights predominate (diversity of contractual relationships, mix of different degrees of copyright/copyleft)?
- How are power and status allocated (is authority assigned or taken or created)?
- What kind of equality matters (hierarchy and/or heterarchy)?

Annex 5 – Detailing the Illustration of Expected and Desired Future Roles of Science in Society (Phase 1)



Rafael Benjamin da Silva

- 1) Longevity and quality of life are increased;
- 2) Big brother? Cameras everywhere and face recognition systems;
- 3) Enhancement of communications a borderless world no more gender issues;
- 4) Science give more power of decision to societies and individuals;
- 5) New results of science more cyber security biotechnology nanotechnology diseases controlled sustainable environment less emissions health care prevention problems with privacy;
- 6) Science;
- 7) Educational system goes beyond human and social values becomes the means of exchange education as an equal sharing knowledge system;
- 8) First baby born in space;
- 9) Innovations in transport will begin human enhancement technologies;
- 10) Citizens and societies are empowered democracy – less corporation and more networking clean energy.



Annex 6 – Detailing the Illustration of the Roles of Science in the Learning Intensive Society (Phase 2)



Rafael Benjamin da Silva

- 1) A world in constant change all physical production is automated;
- 2) No good or bad, just experimentations customization and materialization supporting unique creation;
- 3) No governments organisations are smaller and volatile;
- 4) No money only human values;
- 5) Identity is defined by interactions with others ethics embedded in every interaction bringing to the fore mutual respect, trust and appreciation;
- 6) Stronger connectivity with individuals inner voice and nature;
- 7) No challenge, no competition only union;
- 8) Interaction and creativity lead to unique creation no need for control, of anything;
- 9) Immortality memories, emotions and experiences are eternal;
- 10) Tecnologia connects everything physical spaces are desinged for multiple uses and needs;
- 11) People live in the present uncertainty leads to novelty and innovation;
- 12) Communications happens on the go telepathy;
- 13) Social media - a system that interconnects people a network of collective intelligence;
- 14) No need for life in biological terms, different ways to be alive.

Annex 7 – Detailing the Illustration of New Posed Questions (Phase 3)



The illustration of Phase 3, differently from the previous two Phases, is self-explanatory and highlights the new questions outlined by participants after going through Phases 1 to 3. These may be relevant for anyone interested in better understanding possible roles of science in society as well as that of knowledge creation and exploitation. The new questions are organised around the role and identity of scientists, their way of working and their beliefs, the ways in which science is performed, evaluated and communicated, the ways in which science and continual education can be democratised and evolve towards capacity-based systems, as well as the roles and configurations of government and countries.



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