Introduction to a New Design Paradigm for Inventing Empowering, Evolutive, Regenerative and Fun Technologies to "Play with Complex Futures"

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Abstract

We present in this paper a technological paradigm we have developed as part of a research project – action we are engaged in focusing on the creative and methodical apprehension of ecological collapse. The research question we will explore throughout this paper is: how to harmonize the technological development with our planetary's intrinsic limits?

Firstly, we will present the key characteristics of our increasingly complex era. Secondly, we will introduce our MAGITECH paradigm, by analyzing its core theoretical components: the triad of progress, the commons of capabilities' demo-dynamic, and the FAERIE model.

Finally, we will present the specific research – action methodology we have developed (named *ImagineerInt*) and which led us to the creation of the MAGITECH paradigm.

Keywords: design, technology, popular education, regenerative culture, social innovation, complexity

I. Presentation of the current ecological and social problematic context

> Design is not so much about making things as about how to make things fit gracefully over long periods of time in a particular ecological, social, and cultural context. (Orr, 2002, p.27)

The world is facing the most complex and dangerous crisis in mankind's history. This crisis is fed with many interrelated crisis such as ecological collapse, energy as well as demographic crisis. These self-emerging phenomena make the world increasingly unstable, in other words, unpredictable. The mechanistic way

of reasoning (based on a linear / deterministic way of thinking) thus does not fit this new ecosystemic configuration. We need to *extend* our worldview by operating a harmonious dialogue between logico-rational and narrative mode of reasoning (Bruner, 1986).

The world is getting more and more complex, with heavy tendencies shaping tomorrow's world (less and less scarce resources, increasing demography, climate change, etc).

Current technological[1] paradigms of our industrialized societies are, however, still stuck in the obsolete mechanistic worldview, with a strong waste of natural resources for manufacturing *technical handcuffs* or *black boxes* designed to control people with more and more calculation power inducing a generalized incapacitation.

Coping efficiently with our *post-normal* times requires that we operate a radical change in our relation to technology, by developing and applying new design methods, from:

- Reductionist, techno-scientist worldview aiming at designing for *solution*; to
- Complex, enlarged worldview mobilizing a dialogue between logico-rationality and narrative ways of reasoning aiming at designing for "evolution" (Nijs, 2014, p.49).

This evolution requires the pursuit of an ecological and social direction defined by the individual and collective acquisition, sharing and hybridization of knowledge and *savoirs*[2] (which we define as socially related and evoling knowledge) for self-determination.

A radical change in our social paradigm – in which technological development is embedded – thus needs to be operated, from:

- An intention (translated in the design process) to control / alienate the users (seen as consumers) through the technical and legal deprivation of the right to acquire knowledge about the technologies' true nature and constitution (e.g., source code / algorithm powering it) ; to

1 We define technologies as tools and procedures supporting humanity evolution within growing complexity

2 *Savoir* is a French word whose latin roots come from the word *sapere*, which means "to have flavor", "wise", "to be insightful", "to understand" and "to know". We have chosen not to translate it in English to preserve this semantic depth.

- An intention to empower / capacitate the users (seen as co-creators) for self-determination at the local (territorial) scale, in order to stimulate and reinforce cultural diversity, i.e. social resilience in a changing world.

In a nutshell, we need to design for ecological and social *evolution* instead of *solution* (as classic design does), as linear ways of coping with problems does not suit with complex problems' intrinsic characteristics.

To cope efficiently with this civilizational shift, we have theorized a new design paradigm named MAGITECH. This acronym stands for *Mastering the Art of Glocagenitive Intelligence via Technologies Ecologizing*[3] *a Cooperating Humanity*. Glocagenitive Intelligence refers to universal collective intelligence[4] (Lévy, 1997) fed with locally "genius" creative and regenerative intelligences[5]. This "glocal" intelligence thus stimulates the constant exploration and invention of desirable futures for mankind, according to an ecological and social vision of progress.

The mantra highlighting this paradigm change thus is: *Less raw calculation power for a more sensitive, evolving and distributed one*.

II. The triad of progress and the commons of capabilities' demo-dynamic

In order to embed technological design in the context of a collapsing ecosystem threatening mankind and our *thermo-industrial* civilization (Servigne and Stevens, 2015), we have defined a matrix for designing socially empowering and ecologically regenerative technologies.

First, we think it is fundamental to consider Progress (as ideal) through a triadic conceptual representation defined by the ecological, the social and the technological dimensions. The core idea is that "true" technological progress rests upon both ecological and social progress. We thus defend that technological development needs to be embedded in the "commons of capabilities"[6] paradigm in

3 Based on Edgar Morin's analysis about "ecologizing humanity" (2016).

4 Defined by Levy (1994) as "an intelligence that is distributed everywhere, constantly valorized, coordinated in real time, which leads to an effective mobilization of skills".

5 Naomi Klein (2014, p.447) states that "Resilience – though certainly one of nature's greatest gifts – is a passive process, implying the ability to absorb blows and get back up. Regeneration, on the other hand, is active: we become full participants in the process of maximizing life's creativity".

6 Common resources (developed and managed collectively by peer-to-peer networked communities) allowing the acquisition of knowledge (for living, doing and thinking) about them, with a view to

order to stimulate and strengthen the following individual and collective capabilities:

- Self-discipline: The ability to resist "destructive" urges such as impulsive and excessive consumption;
- Self-sufficiency: The ability to sustain ourselves and our communities in order to allow these social systems to keep functioning within growing complexity;
- Self-organization: The ability for the members of our communities to deal with "organizing" autonomously in order to allow these social systems to keep evolving within growing complexity;
- Self-governance: The ability for the members of our communities to administrate and actualize their own rules to govern their common resources, in order to sustain them based on the Commons paradigm (Ostrom, 1990);
- Self-determination: The ability for the members of a community to master their future, by self-determining their own evolution trajectory within growing complexity.

III. The FAERIE design model defining the MAGITECH paradigm

The MAGITECH design paradigm is based on the FAERIE design model. This acronym stands for "Fun, Aesthetic, Ergonomic, Regenerative, Interoperable, Empowering". MAGITECH must therefore meet key design rules we are now defining.

1. Fun

MAGITECHs are designed to be fun to use, to manipulate and adapt. "Fun" here refers to Jesse Schell's definition of this term (2008, p.37) as "pleasure with surprises". This both systemic and experiential characteristic must, however, stimulate and reinforce the user's capacity based on a *libido sciendi*[7] and a playful attitude toward the object, and not an incapacitated (Stiegler and Renucci, 2012)

strengthening the empowerment of individuals and collectives for self-determination. "Demodynamic" stands for an open, distributed and networked social power stimulating social transformation within growing complexity.

7 Desire to learn, reason, explore and discover.

"consumer" approach defined by "poor" cognitive and behavioural interactions with the system. This dimension of design must thus be at the service of an acquisition of knowledge and know-how by the users and not of their cognitive / psychic and behavioural alienation. The MAGITECH structure has to be "simplex" (dialogic relation[8] between simplicity and complexity). They are thus easy to use and apprehend, but difficult to master through levels of understanding ranging from beginner (global understanding of the meaning conveyed by designers) to experienced (deep / detailed understanding of the tool and its design rules). The latter must foster the "hack value[9]" (Stallman, 2002) of the object, allowing users to imagine and attempt to realize new creative possibilities, in order to implement and stimulate lateral "out of the box" thinking.

Game and toy design theories enlighten and stimulate the MAGITECH design paradigm, in order to design fun technologies that are attractive to a wide audience. Jesse Schell defines game as "manipulation that satisfies curiosity" and toy as "object with which one plays and which it is fun to play with". Games are, according to this game designer, problem-solving activities, engaged with a playful attitude. Game design is thus, through this lens, *motivational design*. Through this design perspective, the real challenge of the game designer is to try to stimulate the motivation of individuals by:

- Making the experience attractive: Get people to watch the system and think "I want to do it, explore its possibilities and exercise my freedom over it by actualizing new ones and extend its intrinsic value and meaning";
- Making the experience engaging: Get people to continue their activity, as they experience pleasure while participating in a communitarian co-creative process based on the free sharing of ideas, information, knowledge and *savoir* about the system and the individuals' relation to it;
- Making the experience easy: The basic level of the MAGITECH's understanding has to be effortless. "Easy to use, hard to master", via different levels of complexity within the design rules (mechanics / story) for a wider spectrum of users with different needs and expectations;

8 Dialogic is one of the key principles of the Complexity paradigm (Morin, 1990): "It is the complementary association of antagonisms that allows us to connect ideas that we reject each other".

9 Computer scientist and hacker Richard Stallman defines hacking as "playful cleverness": "Playfully doing something difficult, whether useful or not, that is hacking" (source: https://stallman.org/articles/on-hacking.html; visited on October 2nd2018).

- Improving experiences by trying to constantly improve the fun relation between the system and its users / co-creators.

The MAGITECH game design process operates a harmonious dialogic relation between solving complicated problems, and apprehending (through evolution) complex problems such as the ones emerging from our "post-normal" era[10] (Sardar, 2010).

2. *Aesthetics*

The MAGITECH design process places a strong emphasis on aesthetics, according to an "ecological design[11]" approach. The designers of MAGITECH thus design their technologies by pursuing a pragmatic ideal[12] of beauty, justice and resilience. The technology must reflect a cultural diversity through an aesthetic interface that encodes design models conceived with sensitiveness, meaning and will to head toward a desirable ecological and social direction. The MAGITECH's aesthetic dimension thus reflects *beauty* and *elegance* through simplexity (systemic complexity encoded in a simple interface). In a nutshell, it respects the following "poetic" design mantra *less* (resources and calculation power) *is more* (human

10 "Post-normal" has been used by Ziauddin Sardar (2010) to qualify times where traditional linear / mechanistic ways of thinking do not allow to produce intelligibility, as growing complexity (and inherent uncertainty) becomes the new "norm".

11 David W. Orr (2002, p.29) states that the etymology of the word « health » reveals its connection to other words such as healing, wholeness and holy. Ecological design is an art by which we aim to restore and maintain the wholeness of the entire fabric of life increasingly fragmented by specialization, scientific reductionism and bureaucratic division. (…) The standard for ecological design is neither efficiency, nor productivity, but health, beginning with that of the soil and extending through plants, animals, and people. (...) It is impossible to impair health at any level without affecting it at other levels. Wahl (p.142) states that ecologically informed, health-generating (salutogenic), and scale-linking design for resilience and systemic health is not a recent innovation. This approach has emerged throughout the past century with the work of pioneers. Most of them explicitly make the improvement of health a central aspect of their work. These pioneers have provided a solid foundation for the emerging theory and practice of transition design for resilient and regenerative cultures. Health stands, in our MAGITECH paradigm, for an aesthetic understanding of complexity. Within aesthetic perception of diversity lies systemic relationship, dynamism, complexity, symbiosis, contradiction to measurement and indefinite and procreative vitality (Collins, 2004). Singularity, discernment and cultural diversity thus increase social resilience through individuation and subjectivation (way to become ourselves – as citizen – among other people, by working together for the same social project).

12 Richard Stallman defines pragmatic idealism in these terms (1998): "If you want to accomplish something in the world, idealism is not enough – you need to choose a method that works to achieve the goal".

intelligence and evolving potential): design simple – yet intrinsically complex from a semantic point of view – interfaces to favour the people's symbolic appropriation of these elegant technologies.

The MAGITECH designers must pursue an "ecological aesthetic"[13]: aesthetic attraction becomes an environmental imperative for sustainability (Hosey, 2012).

3. Ergonomic

The MAGITECHs are designed to be easy to use (in their basic functionalities), so that anyone (children, elderly or disabled people) can use them basically without having to provide too much cognitive and behavioural effort. "Ergonomic" refers here to the study of the relationship between humans and their means, methods and work environments, and of this knowledge application to the design of systems that can be used with maximum comfort, safety and efficiency by the greatest number. In a nutshell, the understanding of interactions between humans and other elements of a system.

4. Regenerative

The MAGITECHs are designed to be as eco-friendly as possible, with a strong emphasis on regenerative resources instead of fossil / non-renewable resources (oil, rare metals such as gold, silver, etc.). In other words, they are designed for:

- Requiring the least possible natural resources;
- Being the most easily and locally producible / reproducible (short circuit logic for physical tools);
- Not to rest, in their resources and construction, on the exploitation of human beings (pillage, slavery, not consented domination through subordination,...) or of nature (in a non-regenerative logic, not respecting its regenerative regeneration cycle);
- To be upcyclable: These products are designed to be easily transformed

13 Architect and "thought leader" in sustainable design Lance Hosey states, in his book *The Shape of Green: Aesthetics, Ecology, and Design* (2012) that aesthetic attraction isn't a "superficial concern", but an "environmental imperative" for sustainability. In other words, beauty is inherent to sustainability, for how things look and feel is as important as how they're made. Drawing from a wealth of scientific research, Hosey highlights that form and image can enhance conservation, comfort, and community at every scale of design, from products to buildings to cities. Fully embracing the principles of ecology could revolutionize every aspect of design, in substance and in style.

into new materials or products of better quality or for better environmental value. The main mantra is based on toy / game designer Gunpei Yokoi's "lateral thinking with withered technologies"[14];

- They must be designed on an open and distributed basis, and according to the commons of capabilities paradigm (Maurel, 2017; Fontaine, 2016 based on Stiegler, 2016, Sen, 1986 and Ostrom, 1990);
- They must be produced / manufactured as locally as possible, with minimal distances to extract and transport the resources necessary for their manufacture, as well as to assemble and upcycle them.

In the context of MAGITECH design, regeneration also concerns cognitive resources and *noetic* capabilities (related to the users' ability to think and reason) favoured by non-capturing and destructive design rules aiming at conditioning the users' attention and deprive them of any "enlightened" relation with the technologies based on a fundamental right to study their core design rules.

MAGITECHs are designed to stimulate and reinforce human and natural ecosystem health and resilience (Wahl, 2016), with a focus on wellbeing and capacity, with more output such as:

- Building territorial resilience through self-reliance, while nurturing inter-territorial collaboration on global issues; and
- Evaluating proposed actions on their positive, life-sustaining, restorative and regenerative potential.

5. Interoperable

The MAGITECH design is based on a set of open standards and free codes to optimize the neutral connections between the different MAGITECH systems and strengthen their both individual and collective modularity (once connected[15]). Thus:

- The system's interface has to be fully understandable, in order to work with other products or systems, at present and future, in either implementation or access, without any restrictions;
- The system's design has to legally and technically allow free and

14 Makino and Gorges (2010).

15 Modularity stands for the degree to which a system's components may be separated and recombined.

sustainable information exchanges, with the consideration of social, political, and organizational factors that impact system to system performance (Slater, 2012);

- The system's design has to rest upon common open standards (social, legal, technical norms and formats) allowing neutral / harmonious (not conflicting) connections with other free and open systems.

These design rules need to reduce variability in intercommunication software while enhancing a common understanding of the end goal to be achieved.

6. Empowering

The MAGITECH's progress mantra ("progress is worth it only if everyone can master it") has to be pursued / achieved via three fundamental values:

- Freedom: To use, study the constitution, share and modify / repair easily and at the lowest price possible;
- Equity: Same potentiality of participation in the design process has to be achieved through the "user as co-creator" paradigm;
- Fraternity: Collaborative practices based on universal collective intelligence gravitating around these technologies have to be encouraged.

Embedding these social values in the design process requires empowering legal and technical structures facilitating by design the production, sharing, hybridization and refinement of knowledge (as *savoir*). These structures are designed to facilitate and reinforce cooperation and inclusive contribution through sharing / hybridization of knowledge within and between communities of users/co-creators. Glocal communities[16] are in charge of ensuring the respect of the open standards and working together to favour the standards' evolution within growing complexity. This communitarian approach requires, being optimal:

- The widespread participation of informed citizens collaborating to create regenerative communities at every scale, empowered / capacitated on a global scale; and
- Self-controlled / hosted physical infrastructures (sovereignty on data), free code and free contents, with strong documenting technologies dynamics.

16 Territorial communities working together synergistically to develop, protect and promote MAGITECHS.

Finally, speculative design (based on design fiction[17]) can favour the social imaginactive[18] transformation. Design is, here, used as a tool to create not only things but ideas (Dunne and Raby, 2014), as speculative means about how things could be, to imagine possible futures and play with them. Dunne and Raby state in their book *Speculative Design: Design Fiction and Social Dreaming* that:

> When people think of design, most believe it is about problem-solving. Faced with huge challenges such as overpopulation, water shortages, and climate change, designers feel an overpowering urge to work together to fix them, as though they can be broken down, quantified, and solved. Design's inherent optimism leaves no alternative but it is becoming clear that many of the challenges we face today are unfixable and that the only way to overcome them is by changing our values, beliefs, attitudes, and behavior. Rather than giving up altogether (…), there are other possibilities for design: one is to use design as a means of speculating how things could be – speculative design. This form of design thrives on imagination and aims to open up new perspectives on what are sometimes called wicked problems, to create spaces for discussion and debate about alternative ways of being, and to inspire and encourage people's imagination to flow freely. Design speculations can act as a catalyst for collectively redefining our relationship to reality (Dunne and Raby, 2013, p.2).

In other words, integrating the speculative design approach in technological design can be a powerful means to "play with futures", not with a predictive linear approach but a dynamic, self-emerging evolution of the technologies considering users as inventive co-creators. These co-creators are thus incited to ask themselves and explore the implications of "what if" questions that are intended to open up debate and discussion about the kind of future they want/desire and do not want /fear. In a nutshell, MAGITECH design communities share and stimulate, through these technologies and their open design process, creative ideas of possible futures, and use them as tools to better understand the present.

17 The Design Fiction method, originally formulated by the artist and engineer Julian Bleecker in 2009, is a method that merges the storytelling and the work of the object in order to better speculate on the future. It has been defined by novelist and journalist Bruce Sterling as "the intentional use of prototypes to break the mistrust or disbelief of change". In other words, this method connotes, according to The Open Window (2017), the design of futuristic artifacts, presented as quite serious, because accompanied by all the promotional packaging (video, use scenarios, website, media buzz, ...) to win our conviction and open the debate.

18 Imaginaction refers to the dialogue between imagination and action to pursue socially / ecologically desirable visions and creative ideas about the future.

7. Design questions summarizing the FAERIE model

These are fundamental questions which summarize the dimensions composing the FAERIE design model:

- What levels of complexity have we defined for our system (basic, intermediate, advanced use)? Do they allow for a learning curve adapted to new users who do not know our system and need to learn how to master their design rules (consider the game design mantra "easy to play, hard to master")?
- What mental model(s) do we expect from users of our system? Which design rules support this/these mental model(s) (structure, graphical interface composed of strategic signs, etc.?
- How can we make the user experience easy, enjoyable, fun and memorable?
- Given what we know about our audience, why will they like this creative / empowering experience, and how can we get them to love it even more?
- How does our technology contribute regenerating the natural ecosystem and increasing social resilience (self-discipline, self-sufficiency, self-organization, self-governance, self-determination and increased cultural diversification of local communities)? In other words, how can our technology foster learning among users of civility, *k*now-how and *conceptual thinking* for resilience and regeneration of living things in increasing complexity? How can we increase and strengthen these processes?
- How to make our technology more accessible to everyone on the planet (considering its use, production and upcycling)?
- How do we facilitate the emergence of positive, salutogenic (health-supporting) systems properties and discourage the emergence of auto-destructive and pathological system properties?
- If our technology is physical: How to build / replicate this technology using the least resources (material and energy) possible?
- How to encode the complexity of our system in the simplest interface possible?
- How to allow the use of our technology by people with disabilities?
- How to allow / stimulate the upcycling of our technology once manufactured?

- How to allow / achieve interoperable communication between our system and other existing systems?
- How to protect our technology as a common good in order to prevent its enclosure (e.g., technical via the use of free standards, legal via the use of free licenses forcing reciprocity, etc)?

IV. Research methodology

Our theoretical work is embedded in the complexity paradigm and, more specifically:

- The complex systems theories[19] and
- The epistemology of invention (Deledalle, 1991): "If we consider the mode of research and acquisition of new knowledge as a design process, the discourse on the scientific method is related to cognitive science models, then back and forth in confrontation between the project of designing and its realization should thus make it possible to enrich. Science, thus, is no longer the analysis and anatomy of what exists positively and therefore necessarily because, like art and technology, it invents new realities."

We have designed the MAGITECH paradigm during a research-action we are currently engaged in, which centres on the creative and methodical apprehension of ecological collapse. We have thus developed and mobilized a specific research – action methodology, named ImagineerInt (Bonnecarrere, 2016). We have created a specific tool that we used in this process, named SOLARIS. This is a scientific model designed to facilitate and reinforce the hybridization of knowledge on a creative basis, in order to stimulate creative and scientific thinking in research, engineering and popular education (Maurel, 2010; Lepage, 2012; Héber-Suffrin, 2010; 2012). This model has been successfully experimented in all these fields, and is being used by researchers, engineers and teachers we have formed. Sociologist Laurence Allard, engaged in "open citizen science" within fablabs, analyzes this model in these terms (2018, personal conversation):

> There is with SOLARIS a grid (a whole circuit) that allows me to organize "social games" based on a collective participation leading to co-built knowledge. I think that SOLARIS is very useful for bridging the gap between academic world and general public. This model is a subtle blend of framing and creative freedom. It allows you to explore and

19 A good presentation of complex systems can be found at (accessed November 10th 2018): https://en.wikipedia.org/wiki/Complex_systemth 2018).

progress within unique paths in a common field, with the idea that we are not only driven by success, but that we also share moments of affect and knowledge. In a way, this tool allows you to "get to work together" in a very concrete way, via a well thought out guidance (with levels as in a game). I like to define it with the metaphor of a social game path, which must be nurtured by participants through "full" (knowledge) and "void" (ignorance). The SOLARIS constraints (in the positive sense of the word) to connect with others, by walking together in an underlying "quest" (we search for something and we do not know beforehand what will happen, nor what we will discover together). I really like this idea of path and thought process, which is not labyrinthine but well guided. The SOLARIS makes it possible to build a better creative reasoning that is dynamic as well as structured. In a process of collective intelligence (as a common "cognitive process"), it constitutes the "cognitive laboratory". In an academic context, it can thus offer a very good tool accompanying and guiding the scientific research process. I would say to synthesize my analysis that this model makes it possible to seek a common knowledge through both a creative and playful approach.

We are currently working with some members engaged in our research – action in a card game development, in order to ease core theoretical concepts learning of our ImagineerInt model.

Conclusion

We have presented, in this paper, a creative and methodical way of thinking and practicing technological design suited for an increasingly more unstable, i.e. unpredictable and complex world. Complex problems of our “post-normal” era require a radical change in our design framework, facilitating capabilities by relying less on calculation power and more on human intelligence for building a viable and sustainable future for everyone. We thus think that it is necessary to operate a radical paradigm shift concerning technology and how to design it, so that mankind can be truly empowered in his apprehension of the most complex and dangerous threat of its history. Ecological collapse *can* be turned into an extraordinary opportunity to rehabilitate – and place at the heart of our societies – intelligibility, sensitiveness and creative synergy. To do so, we as designers need to facilitate these self-emerging social and cognitive phenomena by conceiving fun and creatively empowering systems.

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