Chapter 1
The Creative Revolution That Is Changing the World

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1.1 Introduction

Since the dawn of humanity, we have developed creative technologies, tools that would support externally expressed creations, as ink, carving tools, or sounding objects. Creative technologies have always been the basis for human expressivity: to sustain self-realization, to raise self-esteem, to increase community bonds, and to create a better society. Also understanding technology as "anything useful invented by a mind" (Kelly 2010) encompasses an idea of humanity inextricable from technology. Technology sorts solutions for problems, rises our adaptability, and functions as a second skin between the world and ourselves, as an "extended body of ideas" (Kelly 2010:44). It is part of our culture and of our evolution and is responsible for what we are today.

Nevertheless, in the last 30 years, the development and convergence of a series of technologies has lead to new phenomena. The online sharing of knowledge, ideas, and content and the arrival of new accessible technological tools for creation have enabled many more people to create and express themselves through digital media, leading to massive amounts of rich media content creation by the curious hobbyist all the way to the artists and professionals. So much professional and amateur content is online that you can learn anything just by searching video tutorials, *instructables*, and discussion forums: someone has tried it, someone has tested it, and someone has explained it.

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We then believe that there is a new cultural movement taking shape. This movement is providing a "voice" through which anyone can express to everyone whatever their imagination can create, democratizing innovation and creativity like never before. At the core of this emerging cultural movement are digital technologies that enable the access to sophisticated tools for rich media content creation, sharing of ideas, discussion, and distribution.

An example of such phenomenon is the Star Wars fan film awards. Fans submit entries to that contest, showcasing their ability and acknowledging their appreciation for the Star Wars saga. What used to be completely out of range technically and economically for nonprofessionals, and would signify a massive and expensive effort of a movie studio to produce, has now become possible for dedicated hobbyists to produce sophisticated computer animations.

That and many other examples of entertainment content is distributed, commented on, shared, and reshared over social networks, shaping new ways of what we do for leisure. Increasingly more people are turning off the television and tuning to Facebook to watch what others are saying, commenting on, and following and what is being linked on YouTube, Vimeo, and Blogs.

The more we express ourselves, the more we tend to sense ourselves. We believe that new creative technologies are forming the ground for the next great cultural movement giving voice to user's wishes to express inner feelings, ideas, and visions; transforming; and giving shape to whatever imagination can generate. We believe that the future of technology will be largely determined by end users who will design, build, and share their own worlds, and creative technologies will inspire and support this shaping process.

Not all roses. A recent documentary by David Dworsky, "PausePressPlay" (2011), discusses how the digital revolution of the last decade has unleashed people's creativity and talent, but at some point it questions the dark sides, asking if this is not the end of our cultural industry. Seemingly apocalyptic it raises concerns for our reflection; Andrew Keen shot one of the first rocks, with "The Cult of the Amateur: How Today's Internet Is Killing Our Culture" (2007), which was pursued by Jaron Lanier with "You Are Not A Gadget: A Manifesto" (2010) and "Who Owns The Future?" (2013) and then by Evgeny Morozov with "The Net Delusion: The Dark Side of Internet Freedom" (2012) and "To Save Everything, Click Here: Technology, Solutionism, and the Urge to Fix Problems that Don't Exist" (2013). We understand that there are problems, as there are always with all transformations; our goal here is not to cleanse and paint a one-colour landscape, but we simply chose to focus our analyses on the creative production side, leaving outside the reception transformation. We acknowledge that this will change culture as we know it, raising new drawbacks; however, we cannot forget the new real possibilities all these changes represent for human creativity and all the impact it can have in human life.

In the next sections we will argue that while there have been incredible creative individuals in our history, in fact many more may never have discovered their area of intervention to express their creativity, maybe the technology to allow them to shine never came across. We will look at the events in recent history and the

technological developments that brought to the very edge a new cultural movement. We continue to reflect on what makes a particular technology support this creative revolution movement.

1.2 The Motivation

The creation process is enclosed within us, and because of that has always existed since we exist. Boyd (2009) refers to the need, this urge to express through creation, as "cognitive play" behaviour, a "set of activities designed to engage human attention through their appeal to our preference for inferentially rich and therefore patterned information" (p. 86). The patterned information is key. Humans, among higher primates, prefer regular, symmetrical, and/or rhythmic patterns (Gazzaniga 2008:215). In space and time we sense beauty in "the rule of order over randomness, of pattern over chaos" (Weiss 1955:286). Edward Purcell (cited by Gould 1992) said we have "avidity for pattern" for information forming arrangements that can stimulate in us deep and varied inferences. The functionality of this patterned world and ideas serve to stimulate mind flexibility and with that lead human activity "for engendering creativity, for producing options not confined by the here and now or the immediate and given" (Boyd 2009:87).

Classical views of creativity from Sternberg to Csíkszentmihályi define creativity as something extraordinary, difficult to achieve, and at reach for only a small group of individuals. Csíkszentmihályi (1997:8) states that

> creativity results from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings novelty into the symbolic domain, and a field of experts who recognise and validate the innovation.

The idea is then to produce something never seen before, something outstanding from all previous manifestations. We're talking about symbolical works like the ones created by Michelangelo and Caravaggio, Galileo and Copernic, Mozart and Beethoven, Borges and Pessoa, or Méliès and Eisenstein. These are people who have created a new, from grasp, who have opened up new ways to express, to think, and to imagine the domain itself – works that have been admired, recognized, and validated by peers as truly creative.

Albeit we accept these individuals can have attained levels of performance that outpace the great majority of common individuals, we agree with Gauntlett (2011) when he says that this is a very reductionist perspective of creativity as a human activity. We believe that all humans are creative, and this is central to our quest in this work.

Humans are strongly creative; the main problem most of us have is the lack of opportunities to find the right domain to express our inner ideas and exteriorize them through creative productions. Robinson (2010) defines this finding for the right domain as encountering "the element", the activity in which we feel comfortable enough, in which our passion opens path to go beyond own limitations. Gardner

(1983) has been talking about this for long, demystifying the idea that for people to be brilliant they need to follow narrow and specific literacy scholarly paths. Gardner defined human's performance within eight domains: "spatial, linguistic, logical-mathematical, bodily-kinaesthetic, musical, interpersonal, intrapersonal, and naturalistic".

School as we know it today still lives in the industrial revolution period. The need for a massification of societal behaviours and habits has developed large manufactories that we now call schools. In this environment teachers have no time to look for singular abilities in each student; they fight most of their time to communicate the conventional knowledge and to achieve uniform "positive" results. Students are taught to conform to norms and rules of the majority eliminating the possibility to spot unusual manifestations, thus blocking expressive potential.

We believe it is our responsibility to fight to eliminate this misconception on human normalized capabilities and to help strongly diminish the lack of opportunities of our students to manifest self-expression. Our answer is a new cultural movement we call creative technologies, technologies that enable common people to express themselves. People who had no opportunities to learn how to read musical scores, to learn how to program a computer, and to learn how to sing, paint, dance, film, perform, and design are now given through these new creative technologies new modes to participate, collaborate, and share learning processes which will liberate creativity.

Obviously these persons, beginning new activities, will not produce outstanding works immediately. The goal is not to outperform, but to find the right element, the vocational attitude. The aim is to free people to express, to let them exteriorize their inner feelings though different creative possibilities. We believe that in opening and bringing closer the entire set of creative domains, embedded in participatory culture, we'll be able to explore more fully human potential, because this impulse to create together, helped by creative technologies, will be serving directly two of the most important elements – socialization and self-realization – in the human quest for happiness (Sheldon and Lyubomirsky 2004).

1.3 Cultural State of the Art

The domain of creative technologies has been approached by other topics here and there, like the domain of the "creativity support tools" well supported by Shneiderman et al. (2005), as with all the most recent discussions on participatory culture subjects like the Web 2.0, the user-generated content, the collaboration tools, or the social networks and social media.

Shneidermans' (1987, 1999, 2002) work has always been around the enhancing of human-computer interaction, through the easing of user interfaces; with that he has been looking for ways to improve the access to technologies by more and more

people with as less digital literacy as possible. In 2005 he organized the workshop, "Creativity Support Tools" (CST) (Shneiderman et al. 2005) sponsored by the National Science Foundation.

This workshop intention was stated to have the aim "to develop improved software and user interfaces that empower users to be more productive and more innovative", which shows a bias from creativity into the production processes and task-oriented software. And this bias becomes even clearer when they state the users "include software and other engineers, diverse scientists, product and graphic designers, architects, and many others". Thus the CST was for people already producing and creating; the goal was not to enhance inner creativity but to enhance the production daily processes – creativity tools that facilitate their daily tasks, in part to free their minds for other tasks, possibly more creative tasks.

With creative technologies the goal is not to facilitate workflows; however, it can have that effect, but to facilitate the creative act, to make it happen – to open new "windows" for expression, using digital technologies. Here we agree with the CST report stating that creativity increases with available technologies:

> the capacity of individuals to be creative grows as the software tools spread to diverse disciplines. The first generation of business software such as spreadsheets, database management, email, and web services changed the face of industry and created a global marketplace. The impact of improved software tools is also clearly visible in filmmaking, digital photography, video editing, and music composition. The next generation of these tools will have an even stronger impact as the number of users grows dramatically from few million to a few billion people. (Shneiderman et al. 2005:7)

But needless to say that albeit creative technologies are being spread across the globe, the goal is not to create a "global marketplace" in the sense of creating mass customers, because it goes against the idea of a "few billion people" creating. This was well stated in the "long tail" definition by Anderson (2006) on the changes going on in the cultural markets and more recently well illustrated by Godin (2011) where he defends the shrinking of mass markets, and emergence of thousands of new niche markets, totally in accordance with Anderson "long tail" vision.

Another point from the report where we disagree is on the subject of "creativity enhancement" defended by the report as the main quest. The idea that supports creative technologies is not grounded within the concept of enhancement, but of discovery. Tools are not supposed to improve the person's capabilities, but to help the person to find their own creative unique skills, to output them to the world. As Kelly (2010:350) said,

> if we fail to enlarge the possibilities for other people we diminish them, and that is unforgivable. Enlarging the scope of creativity for others, then, is an obligation. We enlarge others by enlarging the possibilities of the technium – by developing more technology and more convivial expressions of it. (..) can you imagine how poor our world would be if Bach had been born 1,000 years before the Flemish invented the technology of the harpsichord? Or if Mozart had preceded the technologies of piano and symphony? How vacant our collective imaginations would be if Vincent van Gogh had arrived 5,000 years before we invented cheap oil paint?

In this sense creative technologies have as their main goal the task of facilitating creation by general people, to allow general people to self-discover the best of themselves that they can give back to the community.

On the other side of the literary spectrum, we have the debate on the subject of participatory culture. Jenkins has been talking about the changes in the culture of content creation for so long (1992), moving from mainstream media content to artworks produced by amateurs, for example, the gigantic fan base for Star Wars, or Star Trek, which takes communities to produce amateur films, comics, clothes, and toys.

Also more recently Jenkins was responsible for the white paper on participatory culture (2009) funded by the MacArthur program on "Building the new field of digital media and learning". Here Jenkins talks about the shift occurring with culture that have been produced by some to serve the masses, into culture produced by all to serve all, and the new approaches we need to take into account in schools. The discussion focuses around the idea that media literacy taught from the analytical and critical perspective only is not enough and that kids should be also taught about the creative dimensions and learn the skills to express themselves and communicate with all others.

Creative technologies strongly defend this perspective, the need to open up the teaching subjects, allowing different domains to enter schools. Thus new technologies being created are aimed at novices, people with no special knowledge, which sits very well with children at school.

The idea of moving from all-to-one to all-to-all is directly connected with the idea of democratization of knowledge, shortcutting through creative authorities. Gauntlet (2011:49) compares the democratization allowed by the open-source software movement in the 1990s of the twentieth century, with the one developed by the Arts and Crafts Movement in the nineteenth century by William Morris inspired by the writings of John Ruskin. Both movements were responsible for the appearance of subsequent movements that we now label as "do it yourself" (DIY). The DIY creations appear as the basis for the communication all-to-all, engendering a culture of doing things on your own. The DIY emerges because the community, in the sense they support creation and sharing processes, allows creators and also because of the intrinsic pleasure they get from doing, creating, and being recognized by the community, which grants self-esteem. Compensation doesn't come in economic form but as social reward in the form of community acknowledgement.

On this movement to a participatory culture, Shirky (2010:28) reflected about the mode in which it happens, dividing the process in three dimensions: "the means", "the motives", and "the opportunities". Shirky defends that we can have access to a cognitive surplus if we enjoy the free time we have participating and collaborating with others. The day has 24 h, 8 h to work and 8 h to sleep, and we still have 8 h free. The "means" appear with the collaboration with people connected through digital technologies. The collaboration makes it possible to create artworks that are not possible for one person living in isolation. The "motives" surge with the realization of higher-quality works through this connection and admired by the connections.

Finally "opportunities" appear when people connect with technologies that not only allow them to share, participate, and collaborate but also enable them to express their intrinsic creative desires. This simple tripartite process explains the basics for the launching of any new creative technology, as a necessity to open up new opportunities for people to create and express self-talents and to answer to the means generated by the participatory culture and the motivation people feel to get involved in the process.

The digital participatory culture developed in recent years has been also responsible for changes occurring in the funding of creative projects, albeit economic views such as the *long tail* (Anderson 2006) were insufficient to convince editors and producers to give a green light to risky projects. Thus in 2009 a completely new idea emerged among the social creative turbulence online, bringing the charity values into play and creating a crowd funding social software for creative work. *Kickstarter* is only one of these systems that allow any person to pledge for his future work on journalism, music, film, games, or even a start-up company. The production here is reversed: consumers pay before consuming; they pay to see, hear, or play; but they also pay to strengthen creative community values. No more editors, people communicate directly, people share problems and share needs, and people exchange knowledge and help each other. This is the final frontier, where authors meet receivers and interact for real and where all can be authors and consumers at the same time.

1.4 Technological State of the Art

At the beginning of the 1980s, the first home computers appeared, the microcomputers ZX Spectrum, BBC Microcomputer, and Commodore 64. Using these microprocessors (which only had 8 bits, 16 Kb of RAM, no hard drive, and as support to exchange content the old magnetic cassettes) changed the world of communication, playing, and creation. In order to create games or applications, people needed to know how to code BASIC, but BASIC couldn't serve the graphical needs of games, so it would demand assembler skills, which is difficult for people with little or no programming skills. What then happened was truly dignifying and representative of the power of the communities and their sharing values. Some of programmers created software packages that would help nonprogrammers to create their games. Packages like *The Quill* (1983) by Howards Gilbert, *Games Designer* (1983) by Quicksilva, and *Graphic Adventure Creator* (1985) by Incentive allowed people with creative ideas for games to be able to create them. Although it was not of the same quality of a program totally created from scratch in assembler, it was possible for anyone to prototype and demonstrate his or her visions. These tools came with what we call one of the fundamental basics of creative technologies, embedded knowledge. Users were able to create new projects because tools were embedded with knowledge from programmers in the form of editors, behaviours, and other structures.

These developments contributed to the creation of a new business model that we call today "authoring software" – software that takes users by the hand in the process of integrating multiple types of media with almost no programming, applications like *Hypercard, Hypermedia, Macromedia Director, Adobe Flash*, or the new HTML5 editors. All these packages transfer knowledge from specialists to nonspecialists in usable and comprehensible forms; hence all these authoring tools belong to the creative technologies domain.

In 2007 the authors of this chapter released the application *Emotion Wizard,* a prototype that allows users with no skills in the design of virtual worlds to very quickly and easily set up the mood of 3d environments (Zagalo and Torres 2008). In the same year the MIT group, Lifelong Kindergarten, using the mantra "Showing the Seeds for a More Creative Society", delivered the visual programming language, called *Scratch*. They wanted to permit nonskilled users, the children, to create "from scratch" their "own interactive stories, animations, games, music, and art",[1] in synthesis, to express themselves, giving external form to inner, private, and individual imagined worlds.

Scratch visual metaphors have been so successful that in 2010 Google used it to create *Google App Inventor*,[2] a tool allowing anyone to create their own software applications for the Android OS. And again in 2011 another company created *StencylWorks*,[3] a game engine to permit anyone to create games, making use of a programming layer based in Scratch and working upon Actionscript 3.0.

In parallel to the "authoring software" evolution, back in the 1980s appeared another community movement, grounded in mass collaboration that came to be defined as the GNU Project. Created by Richard Stallman from MIT in 1983, it was a response to all corporate software. The goal was to liberate creativity by granting free access to the code to improve software and free to redistribute it to anyone. Free software emerged as a leading force for computer communities all over the world. The concept created a movement, which opened the digital arena for totally freedom and creation – liberation from the "not do," from the copyright infringements, and from the corporations laws impeding consumers creativity. The free software movement then merged in 1998 into the movement on open source.

In 2002 the open-source movement, typically restricted to the computer science communities, expanded to receive creators with no digital skills, Web 2.0 emerged, the term RIA (Rich Internet Applications) was coined,[4] and the first Creative Commons licenses were released.[5] This larger group was in the first phase much more concentrated on sharing activities; the creation was limited to productions with text (e.g. blogs), maybe because most of the initial tools where not yet open to other possibilities.

[1] Scratch information can be gathered at http://info.scratch.mit.edu/About_Scratch

[2] For more information on the tool, visit http://appinventor.googlelabs.com/about/

[3] For more on StencylWorks, visit http://www.stencyl.com/stencylworks/overview/

[4] Jeremy Allaire, 2002, Macromedia Flash MX – A next-generation rich client, Macromedia White Paper, http://download.macromedia.com/pub/flash/whitepapers/richclient.pdf

[5] On the history of Creative Commons, visit http://creativecommons.org/about/history/

2005 saw the real impact of having an open-source spirit working for the larger online communities, producing more and more free tools[6] that would allow people with low technical skills to create. That's when the concept of user-generated content (UGC) appeared, and free distribution gained allies with the birth of YouTube. During 2005, discussions started among the game community for the necessity of player-generated content (PGC) in order to respond to the high-content demand of the next-generation consoles (PS3 and Xbox360). Companies were afraid of being unable to deliver the detailed content permitted by these new generation consoles. Will Wright, creator of *Sims*, appeared in the front line with *Spore*, an evolutionary game with in depth layers of AI, the so-called "procedurally generated content".[7] Wright's goal was to develop an intelligent world, which would be able to interact with the creative desires of the players. With a bunch of editors within the game, players would become creators "from scratch",[8] of their own worlds, their own games.

Then during the second half of the decade, new Web 2.0 tools started to appear. Albeit existing authoring multimedia tools, and networks for sharing and distribution, there were still limits to the creative process in the sense that past the facilitation of sharing with the world and facilitation of programming you still needed to bring into play all the assets you wanted to integrate (text, images, audio, animation, and video). Thus you still needed literacy on the creation of the assets. Consequently a lot of Web 2.0 tools started to develop their interest in providing technology with knowledge embedded in order to suppress this lack of literacy – tools like *Mindmeister* for idea organization, *Picasa* for photo editing, *Sumo Paint* for illustration, *ComicSketch* for comics, *SketchUp* for 3d, *GoAnimate* for animation, *Animata* for real-time animation, *Animoto* and *Masher* for video, *Audiotool* for music, or *Creaza Audio Editor* for sound.[9] All these creative tools allowed for the creation process within collaborative settings, and build for community sharing. Most of them used databases of media elements, mostly built by other creators online, in order to ease the creative work. These new creative tools were opening new dimensions for the facilitation of creation by general people and at the same time making possible self-discovery.

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[6] At the moment we can find hundreds of free online tools available on the Web, tools that serve media as text, photography, music, video, and games. Examples can be found at http://www.go2web20.net

[7] Game Developers Conference of 2005 was a rich gathering of discussions on the subject of procedural content. Will Wright conference on "The Future of Content" marked that year. Read more at http://www.gamasutra.com/gdc2005/features/20050315/postcard-diamante.htm

[8] idem.

[9] All these tools can be accessed online and free. Sumo Paint can be explored at http://www.sumopaint.com, ComicSketch can be explored at http://mainada.net/comicssketch, GoAnimate can be tested at http://goanimate.com, Animata at http://animata.kibu.hu, Animoto can be accessed at http://animoto.com, SketchUp at http://www.sketchup.com, Masher at http://www.masher.com, Audiotool can be used at http://www.audiotool.com, Audio editor can be accessed at http://www.creazaeducation.com/audioeditor, and Mindmeister can be accessed at http://www.mindmeister.com

This discussion however goes beyond virtual worlds and digital assets; between 2005 and 2008, physical and low cost devices for all were a dream coming true, thanks to Arduino[10] and RepRap.[11] People from all over the world, with little to no resources, would be able to create artefacts that until that moment would necessitate highly expensive machines only available to the biggest world corporations. All these new technologies have opened up complete new hands-on possibilities and, together with the social networks, have been crucial in creating community ties, to increase collaboration and participation, opening space for more elaborative creative technologies allowing in depth collaborative creation.

1.5 Traits of Creative Technologies

As we have seen from both previous points, cultural and technological, creative technologies are strongly grounded in two ideas: facilitation for everyone and creation within environments of collaboration and participation. But these technologies still need to guarantee that they will be able to attract people willing to create, because as Robinson (2010) and Csíkszentmihályi (1990) said, to engender creativity we need to be able to evoke passion and fun. Both emotions play an essential role in pushing levels of self-motivation, dedication, and perseverance in the pursuing of original creation. Having fun while playing (Brown 2010) with creative technologies and finding new passions will guarantee the success of these new tools.

One example that encompasses all these ideas is *Scratch*. Its approach to visual programming was able to embed programming knowledge into visual elements, in a very easy approach. The embedded knowledge permitted users to enter the world of programming and discover own interest in the beauty of logics without effort. But *Scratch* was not the first tool to put programming in a visual and embedded form; then why all this success? We believe that great deal of the success was achieved, thanks to the *Scratch* community, which was designed with participatory culture in mind. Hence, the easiest way to publish work created in *Scratch* is through the *Scratch* website, but more interesting than this is the openness of *Scratch* projects in their library. Anyone in the community can download and open any project in the Scratch library. This means that any person in the community can use code made by others and assets created by others. This means that whenever someone doesn't know how to code something, they just need to go to the library and look for an example matching his interests. If someone doesn't know how to draw, or how to create sounds, they can use them from other artworks in the library. Scratch is a creative technology in all senses, because it not only makes it easier through embedded knowledge but also through sharing knowledge. Due to the tool being free plus

[10] For more details on the building of Arduino, watch the "Arduino The Documentary" (2010) at http://arduinothedocumentary.org

[11] RepRap is a concept defined as the replicating rapid prototype, a 3D printer, developed by Adrian Bowyer. More about the project at http://reprap.org

the content in the projects, this defines a community built, on social recognition, and not on moneymaking. Finally all this together creates the perfect fun environment for people to create, share, learn, and discover their own creative motivation.

Another recent example of a creative technology is *Minecraft* developed by Markus Persson in 2009 and initially given free to players. *Minecraft* is generally defined as a game, but it's much more than that. Like LEGO it allows any person to build any world, without having any previous skill or technical knowledge. The building has been greatly simplified by using a visual approach made of cubes only, like LEGO pieces, and a basic Boolean logic circuitry. Similarly to *Scratch* it is possible to create animated and interactive digital artefacts that can be experienced by the community. Different from LEGO, the entire community is online and can visit projects and worlds made by others in the moment. Not only can users enjoy these worlds, but they can also learn how to give shape to new ideas. The community also shares packages of textures for the building or skins for the characters, helping people to constantly raise the level of quality of their creations.

These two examples show us that any tool, the simpler it is, need to convince people to persevere in performing, in order to be rewarded. Also looking at Scratch or *Minecraft*, we can easily understand that beyond the immediate labels of being a tool or being a game, the most important feature we can emphasize in them compared with other tools and other games is the fact that both can be defined as toys.

Toys define objects designed for the act of play. Toys categorize any kind of artefact that allows people to interact with, not necessarily with a purpose, but able to reward the interaction or simply stimulate fun. Together with these aspects, another high interest in toys comes from the fact that they serve learning purposes. Consequently, the mixing of fun and learning helps toys rise to the condition of objects that easily activates engagement in players, which is essential to maintain perseverance of the use.

Adding to this, we should also say that *Minecraft* could easily be defined as a tool, because beyond permitting people to play in-world, the world can serve the purpose of simulation, or the creation of scenarios for video and pictures. Tools are designed to facilitate actions to be performed, to help the process of creation or deconstruction. Contrary to toys that are normally the objective itself, at the end of our actions, tools serve more as a means to attain something else. The object itself is not engaging, but it can transform the activity being performed in a more appealing one. Being able to perform our task well using a tool, the process to master that tool can be highly rewarding.

Finally we can also say that Scratch beyond being a tool is immensely used as a game, more even if we think about the open community galleries, and social reward systems, that prize achievements done with the tool. Hence a game defines a set of rules commonly designed within an artefact with the purpose to engage players in the activity. Games are designed to captivate completely the attention of the players and normally reward the attention with sensations of fun, like toys do. Also performing tasks in games well, being able to master the game rules, can be highly rewarding as with tools. On the other hand games are very different from toys in the nature of purpose, because there's always an objective for any action performed.

The game also differs from the tool in that the game is the end itself and doesn't serve as a means to attain anything outside the boundaries of itself. In this sense, Scratch is really a game, because most of the creations built within Scratch don't serve to be used outside that domain, even the project files are not exportable to any other model.

All this said, we should state that the three main traits that make a technology become creative is the ability to respond to the needs of being a toy, a game, and a tool. Creative technologies should then be able to:

- Elicit attractiveness and easy interaction, like a toy.
- Engage, motivate, and maintain concentration while pushing for mastery, as games do.
- Serve a purpose, like help, guide, connect, or facilitate the attaining of an objective, as a tool.

1.6 Conclusions

An increasingly wider set of technological tools are emerging and enabling new ways for a democratic creation. These tools are accessible and available to anyone and forming the new mechanisms for self-expression, for communicating points of view, or for raising one's attention. Examples range from viral videos to interactive artworks, but looking below the surface reveals new modes of learning and enjoying life.

These new technologies are opening horizons for new creative demographics. On one hand, facilitating creation by general people, through the embedding of knowledge, and pushing motivation for perseverance from the natural will to self-discovery in each person and, on the other hand, pushing for a participatory culture made of content generated by all – creating a culture that is open and free, built on the values of community and social reconnaissance against financial retributions.

Finally, these new tools are being shaped within a tripartite conception of functionality, that of being at the same time a toy, a tool, and a game. This conception is the guarantee to create technologies that will motivate people to struggle for the self-discovery in search of their inner creation desires.

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