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THE CREATION PROCESS IN DIGITAL ART

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Introduction

The process behind the act of the art creation or the creation process has been the subject of much debate and research during the last fifty years at least, even thinking art and beauty has been a subject of analysis already by the ancient Greeks such were Plato or Aristotle. Even though intuitively it is a simple phenomenon, creativity or the human ability to generate innovation (new ideas, concepts, etc.) is in fact quite complex. It has been studied from the perspectives of behavioral and social psychology, cognitive science, artificial intelligence, philosophy, history, design research, digital art, and computational aesthetics, among others. In spite of many years of discussion and research there is no single, authoritative perspective or definition of creativity, i.e., there is no standardized measurement technique. Regarding the development process that supports the intellectual act of creation it is usually described as a procedure where the artist experiments the medium, explores it with one or more techniques, changing shapes, forms, appearances, where beyond time and space, he/she seeks his/her way out to a clearing, i.e., envisages a path from intention to realization. Duchamp in his lecture "The Creative Act" states the artist is never alone with his/her artwork; there is always the spectator that later on will react critically to the work of art. If the artist succeeds in transmitting his/her intentions in terms of a message, emotion or feeling to the spectator then a form of aesthetic osmosis actually takes place through the inert matter (the medium) that enabled this communication or interaction phenomenon to occur. The role

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of the spectator may become gradually more active by interacting with the artwork itself possibly changing or becoming a part of it [2][4].

When we focus our analysis on the creation process in digital art we easily conclude it is intrinsically linked with the design and development of computer-based artworks. By exploring computer technologies digital art opens to new type of tools, materials and artworks as also establishes new relationships among creators, artworks and spectators or observers, largely not comparable to previous approaches.

Indeed we can describe art objects as simple symbolic objects that aim at stimulating emotions. They are created to reach us through our senses (visual, auditory, tactile, or other), being displayed by means of physical material (stone, paper, wood, etc.) while combining some perceptive patterns to produce an aesthetic composition. Digital art objects differ from conventional art pieces by the use of computers and computer-based artifacts that manipulate digitally coded information and digital technologies, i.e., they explore intensively the *computer medium*, what opens unlimited possibilities in interaction, virtualization and manipulation of information. These digital art objects or artifacts, where some are possibly non-tangible, constitute, in fact, the resulting product from the artistic creation process that together establishes a common communicational and informational space. Information or information content, meaning the intended message of each artifact, is a central constituent of this common communicational and informational space. Accordingly, artistic artifacts, may these be of digital or physical nature can be defined as informational objects. The computer medium is defined here as the set of digital technologies ranging from digital information formats, infrastructures to processing tools that together can be observed as a continuum art medium used by artists to produce digital artifacts [9][10].

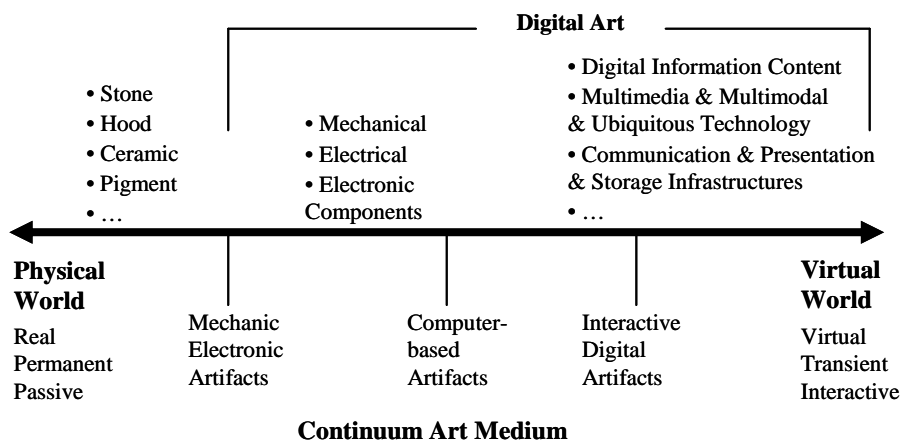


Figure 1. The Continuum Art Medium.

When we consider the creation process itself, we can establish its beginnings when the creator gets an hold of the first concept or idea resulting from his/her subjective vision, gradually modeled into a form of (un)tangible artifact. It constitutes the message, this *about* something, the artist wants to transmit to the world. When digital content is used in

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this process, it can be both the means and the end product. On one hand, the digital content can be explored as the means to create non-digital artifacts, as for instance, digitally altered paper-based photography, and, on the other hand, be the end-result intended as it is the case in animated comics.

In fact, digital art applies the computer medium both as raw material (e.g. the digitally coded information content) and as a tool of enhancing creativity. The reader shall become aware of the fact that raw material is related here to unprocessed (or in minimally processed state) material that can be acted by the human labor to create some product. Similarly, digitally coded information content can be manipulated by digital artists to create artistic objects. When in the creation process, digital artists apply information content along with technologies from multimedia, virtual reality, computer vision, digital music and sound, etc. as also the information and communication infrastructure available such are the internet, presentation devices, and storage arrays, among others, to create interactive installations and generate digital artifacts. Therefore, the computer medium traverses effectively all the stages of the creation process, from concept drawing until the final artifact production and exhibition. Today's powerful editing and programming tools make it possible to an artist to modify, correct, change and integrate information content as valuable raw material in the creation process, that may be presented in several digital formats such are text, image, video, sound, 3D objects, animation, or even haptic objects.

We are here interested in the creation process of the artifact *per se*, following a model based in what Routio, in his works on arteology (the science that studies the artifacts), labels as *project-specific artistic development* that purports to assist the creation of a single artifact (or a series of them) by defining its goals and providing the conceptual model on which the work of art shall be based [12]. Thus and because it deals intensively with the computer medium, in digital art this creation process inherits aspects from computer systems development (even hardware/software engineering) and design process. The artifact's message, narrative and end-shape design is pivotal as also its technological implementation and final deployment within a exhibition space [7][8].

Moreover, artistic communities need to have access to common technological infrastructures that facilitate collaboration (collaborative editing, annotating, etc.), communication and sharing of work experiences, of materials, being these, unprocessed digital content or final artifacts, activities that are essential for a soft progress from the starting concept to the final artwork. We argue here that as in other human activities, artistic creation benefits from the collaboration within a community of equals while having access to materials and tools. Such common information space is in effect a creative design space; thought design (in the sense of shaping) is the fundamental activity in the creation process of digital art.

In this chapter we propose to analyze and discuss the main concepts and definitions behind digital art while proposing a model for the creation process in digital art. It allows for a smooth progress from the concept/idea until the final product (artwork) while exploring the computer medium to its maximum potential. The chapter is divided in the following sections: first we give an overview of the background of digital art in terms of its fundamental concepts and developing vectors. Next we describe the creation process

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for digital art, embracing the creative design space architecture while presenting concrete examples. Finally we draw out some conclusion.

Digital art fundamentals

Digital art has its roots within the first decades of the twentieth century with isolated experiments created by a few visionaries whose results were mostly exhibited in art fairs, conferences, festivals and symposia devoted to technology or electronic media. These first artworks have been mostly classified as marginal to the mainstream art world. Alike in the Dadaist art movement some of these artworks were seen as a form of *anti-art*.

The development of science and technology has been the principal engine of the evolution of digital art. But, what we know today as digital art has been strongly influenced by several art movements such were, among others, Fluxus, Dada, and Conceptual Art. These movements brought into digital art the emphasis on formal instructions, the focus on concept, on the event *per se*, and also, the emphasis on the viewer's participation, contrasting to the art based on unified static material objects. From the Dadaism specifically, digital art inherited the concept of creating art by using precise predefined rules, i.e., a finite set of instructions generates the final artwork (a poem, a painting). The rule' or algorithm' instruction was adopted as the conceptual central element in the creation process. *Instruction-based* art is a fertile soil of today's digital art. Similarly, the Fluxus art movement has also extensively explored the idea of instruction-based generated art along with the immersion of the audience in the event, forcing an *interaction* between the spectator and the artworks. Influences from the Conceptual art, a movement emerged in the 1960s, came from its central statement "the idea or concept is the most important aspect of the work". This is still a way of thinking and practice common to many digital artists in all over the world. The concept or idea is the leitmotif for the shaping of the digital artifact. It means that "all of the planning and decisions are made beforehand and the execution is a perfunctory affair, i.e., the idea becomes a machine that makes the art", by artist Sol LeWitt (1967).

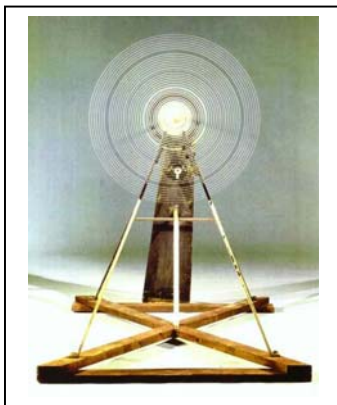


Figure 2. In the left: *Rotary Glass Plates (Precision Optics [in motion])*, 1920, by Marcel Duchamp. In the right: *Autopoiesis*, 2000, by Kenneth Rinaldo (courtesy of the author).

Digital art, as it is known nowadays, entered the world art in the late 1990s when museums and art galleries started increasingly to incorporate digital art installations in

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their exhibitions. The Intercommunication Center (ICC) in Tokyo, Japan; the Center for Culture and Media in Karlsruhe, Germany; the Ars Electronica Festival in Linz, Austria; the EMAF - European Media Arts Festival, Osnabrück, Germany; the VIPER (Switzerland); the International Art Biennale of Cerveira, Portugal; and the DEAF - Dutch Electronic Arts Festival are examples of initiatives that have supported and initiated digital art consistently all over the last two decades. Digital art is today a proper branch of contemporary art [10][11].

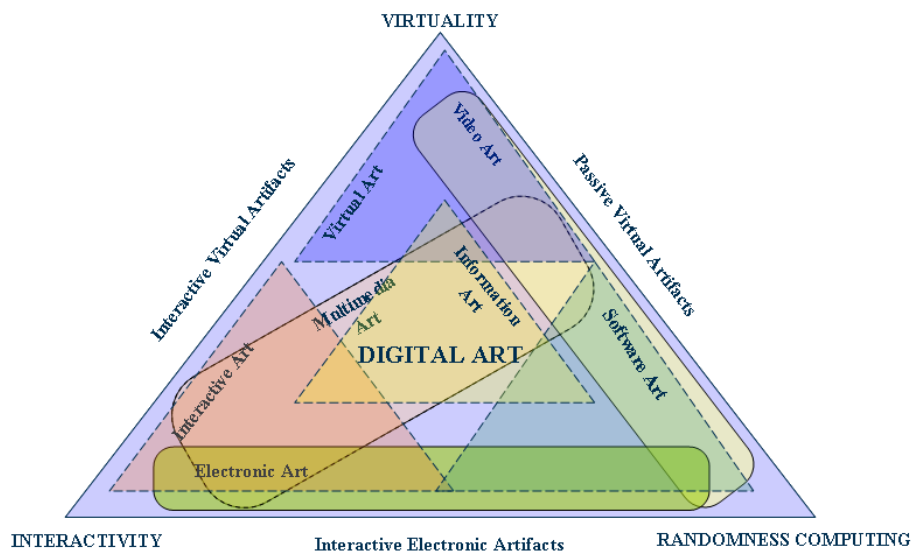
Today's digital artifacts range from virtual life as it is the case of *A-Volve* (1994) from Christa Sommerer and Laurent Mignonneau, a virtual environment where aesthetic creatures try to survive; to artificial life robotics installation such is *Autopoiesis* (2000), by Kenneth Rinaldo that presents sculptures with sensors that react to the visitor by moving their arms towards the person provoking attraction or repulsion. Virtual Characters (usually called Avatars), Internet art and Cyborgs are topics where digital artists are active nowadays. A more comprehensive overview of the today's aesthetic digital artifacts can be obtained from Paul Greene [11].

Definitions

Digital art is in fact a recent term that became a general designation for several forms of computer-supported art, from *computer art* (since 1970s), *multimedia art*, *interactive art*, *electronic art* and more recently, *new media art*. Under the definition of digital art there are several art branches commonly connected to the specific media or technology they are based on.

We define **digital art** as *art that explores computers (tools, technologies and digitally coded information content) as a tool and material for creation*.

In the course of this definition digital art has to incorporate the computer medium in its creation process, even if the final artifact does not visibly integrate computer or digital elements.



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Figure 3. A general categorization of digital art.

In fig. 3 we present an overview of the different artistic areas related to digital art. As we can observe, digital art embraces, by definition, all type of computer-supported art.

Digital art is mainly based on three grounding concepts: *controlled randomness access*; *presentational virtuality* and *interactivity* that have been behind emergent artwork from the 1960s to today's digital art installations. They can be described as follows:

- *Randomness Access*: (pseudo) non-deterministic instruction-based algorithms open the possibility of instant access to media elements that can be reshuffled in seemingly infinite combinations;
- *Virtuality*: the physical object is migrated into a *virtual* or *conceptual object*. The *concept* itself becomes perceptible through its virtualization;
- *Interactivity*: the viewer may assume an active role in influencing and changing the artwork itself.

The artwork is often transformed into an open structure in process that relies on a constant flux of information and engages the participant in the way a performance might do. The audience becomes a participant in the work, resembling the components of the project that may display information of a specific perceptive nature (visual, auditory, tactile, or other). The artist plays usually the role of facilitator for the participant's interaction.

Creation process

The creation process in digital art relies often on collaborations between an artist and a team of programmers, technicians, engineers, scientists and designers, among others. This collaboration implies a multidisciplinary work involving art, science, technology, design, psychology, etc., that form a common communicational and informational space. Due to the widespread of the digitally coded information content that is increasingly available in high expressive multimedia formats, the creation process is becoming more and more based on the manipulation and integration of digital content for creation of artworks.

Accordingly, we need a common creative design space where digital artists can smoothly progress from the concept/idea until the final product (artwork) while exploring the computer medium to its maximum potential. This common creative design space incorporates necessarily a communicational and informational space beneath, where digitally coded information content of different nature and level of processing is available for the artists' use. Furthermore, tools for editing, design or for any specific processing and composing have to be offered along with facilities for communication and collaboration among the community members. The creative design space shall also provide tools to support all the activities at all phases of the creative design process, ranging from the drafting phase, passing through the artifact's implementation phase until the artifacts exhibition preparation (exhibition space design) as also the access to physical and/or digital exhibition space. This way, the creative design space will facilitate the establishment of communities of interests in art, where people from different backgrounds share materials (raw material), and digital collections while collaborating throughout common goals.

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The meaning of design in this context, appoints to a conscious effort to create something that is both functional and aesthetically pleasing. Design is here taken from both the perspective of design in engineering and from a more inventive view as it is the case in applied arts.

As Löwgren and Stolterman [8] state design is always carried out in a context (p.45). In digital art, design of digital artifacts is mainly based on the conceptualism's aphorism where the initial "idea or concept becomes a machine that makes the art" (Sol LeWitt, 1967). However, unlike in the pure design process, where the problem-solving guides the action of the designer, in digital art such systematic manner appears not primarily to solve a problem but to enhance the intention to the realization, i.e., the final artifact. Generally, artists follow an alike process in developing their creative ideas, though they may be less conscious of the process they are following. Initially the artist will tend to experiment in a rather random manner, collecting ideas and skills through reading or experimentation. Gradually a particular issue or question will become the focus of the experimentation and concrete implementation, formulating alternative ways, trying them, in order to adopt a refined one that will be pursued through repeated experimentation [7]. Thus the design process itself evolves from a vision or idea (even if it is not aware for the creator) until the final digital artifact is released. The message the spectator can obtain from the artifact in terms of a personal or group experience is the central issue the digital artifact holds.

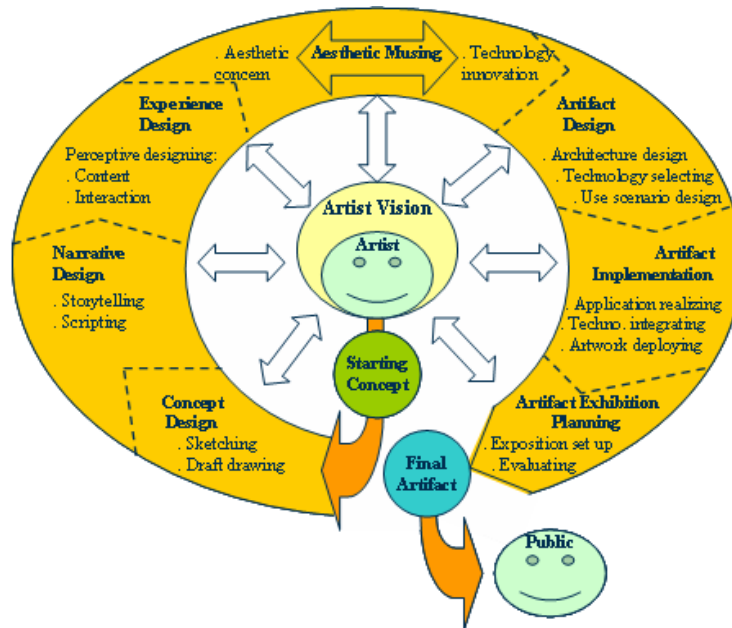


Figure 4. Overview of the Creative Design Process phases.

From this point of view the digital artifact is nothing but a designed thing built around a core of digital technology. In digital art context, the artifact is an object embracing information content displayed by means of digital media or a combination of digital and physical components. The artifact acts as a materialization of a message, a piece of information, throughout the presentation of information content intended to stimulate

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emotions, perceptive experiences on side of the user. Thus, artistic digital artifacts, being these of pure digital or a combination with physical constituents are more adequately defined as *informational objects*.

Digital content is defined as informative material of digital nature that holds the ability to be acted to transmit a message. Some authors, as for instance Robert Musil in his unfinished novel "*The Man without Qualities*", refer to digital technology and by legacy, digitally coded information content, as the material without qualities due to its pervasive characteristics and constantly development. These are, however, characteristics that open, almost on a daily basis, new challenges and possibilities for aesthetical experiments since the computer medium can constantly wear new presentational facets.

The process

The creation process in digital art is mainly based on the design of the artifact's message and its development. The computer medium in the form of editing, communication and collaboration tools as well as digitally coded information content is likely to be always present and traversing the overall creation process.

As depicted in figure 4 the creative design process is launched when the artist gets hold with an initial idea/concept. Then, the artist starts to design the concept, entering a process that will lead into the final artifact. This process is not a linear process, on the contrary, artists may go back and further in the activity sequence, skipping one or focusing the work in another. The process is usually highly dynamic, yet, the artist's vision is always present. The creation process involves the following phases:

Message Design phase:

- Concept Design: in this activity the artist gets involved in converting his/her idea/concept or vision into a set of sketches, informal drawings, i.e., the abstraction is concretized in a perceptive structure. The artist does exploratory drawings that are not intended as a finished work. The outcomes of this activity are, thus, sketches, drawings that allow the artist to try out different ideas and establish a first attempt for a more complex composition.
- Narrative Design: here the artist takes the drawings resulting from the concept design activity and designs a composition, a construct of a sequence of events that set up the message that will allow the users/viewers an emotional connection which grants memories and recounting of the artwork. The narrative of the message behind the initial concept is designed taking into consideration aspects such as the structure of its constituent parts and their function(s) and relationships. The narrative assumes the form of a chronological sequence of themes, motives and plot lines. The outcome of this activity can be resumed as the design of the message as a story.
- Experience Design: this activity embraces the process of designing the message, taking into account its related concept and narrative, to design and conceptualize specific characteristics of each narrative event from the point of view of the human experience it shall provide. This design or planning of the human experience is made based on the consideration of an individual's or group's needs, desires, beliefs, knowledge, skills, experiences, and perceptions. The experience design attempts to draw from many sources including cognitive and perceptual psychology, cognitive

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science, environmental design, haptics, information content design, interaction design, heuristics, and design thinking, among others.

Aesthetic Musing: this is a central activity in the creative design process, it represents the moments of contemplation where the artist revise his/her vision against the decisions made (to be done) during the design and development of the artifact. We identify two guiding vectors in aesthetic musing of artifacts:

- Aesthetic concern: process of integrating characteristics in the artifact that eventually provide a perceptual experience of pleasure, meaning or satisfaction, arising specifically here from sensory manifestations of the artifact such are shape, color, immersion, sound, texture, design or rhythm, among others. Beauty here relates almost exclusively to the aesthetic dimension of the perceptive nature of the artifact components.
- Technology innovation: process of integrating novelty in the reshape, use, combination and exploitation of digital technology. This appoints to the computer medium dimension of the beauty creation, i.e., the technology is a driven force to set up new aesthetic dialogues. Taken the fact of the digital technology is under accelerated development; integration of high levels of technology innovation in digital art is commonly desired.

Artifact Development phase:

- Artifact Design: this activity relates to all aspects concerned with the design of the computer system or application that will support the final artifact. This includes the design of the system architecture, interface and interaction, as well as the selection of technology to implement them. Since the artifact is to be acted usually by an audience of viewers, we have also considered in this activity the design of the use scenario from the technological point of view. Design adopts here a hybrid perspective mixing aspects from applied arts and engineering. It applies principles from a more rigorous design based on exploitation of technology, science and even mathematical knowledge along with the aesthetical concerns.
- Artifact Implementation: in this activity the artist proceeds to the implementation of the artifact itself. This incorporates tasks as programming, testing and debugging, as well as, technology integration and the final artifact deployment. This demands from the artist to hold programming and technological skills if he/she wants to have a more direct control over the implementation process. The artist can even be assisted by a team of programmers and technologists; however, to be in command of the artwork, the artist has to be skilled in technology to a certain level.
- Artifact Exhibition Planning: this activity joins together all aspects related with the setting up of the artifact exhibition. This represents the final stage of the overall creative design process, where the artifact is brought into the world, i.e., the art object meets the audience. The success of this meeting will depend increasingly on the attractiveness of the artifact, the way the exhibition space is organized, how the logistic of its different components are managed and supported and also on the contextualization of the artifact in the overall exhibition. Notice this activity will be based on the decisions made before in terms of the message design, the artifact implementation, and above all, on the use scenario configuration. Artifacts may be

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presented in museums, art halls, art clubs or private art galleries, or at some virtual place such is the Internet.

The creative design space architecture

The creative design space is the local, physical and virtual, where the creative design process is realized. As previously defined, a creative design space is a digital communicational and informational space that enables the generation of artistic content, the storage, transmission and exchange of digital data while providing the exhibition and presentation space for access to information and content by both specialists and the public.

The creative design space aims at supporting an artistic community by enabling all the main activities of the creative design process by providing tools for design, shaping, planning, collaboration, communication and sharing of information as well as giving access to digitally coded information content of diverse nature. Usually, such a space has also to provide exhibiting facilities for presentation of final artifacts to the audience.

As a whole, the creative design space as depicted in fig. 6 is not entirely affected either by technological advances or the needs of users and creators. The flow of work from one activity to another remains conceptually the same.

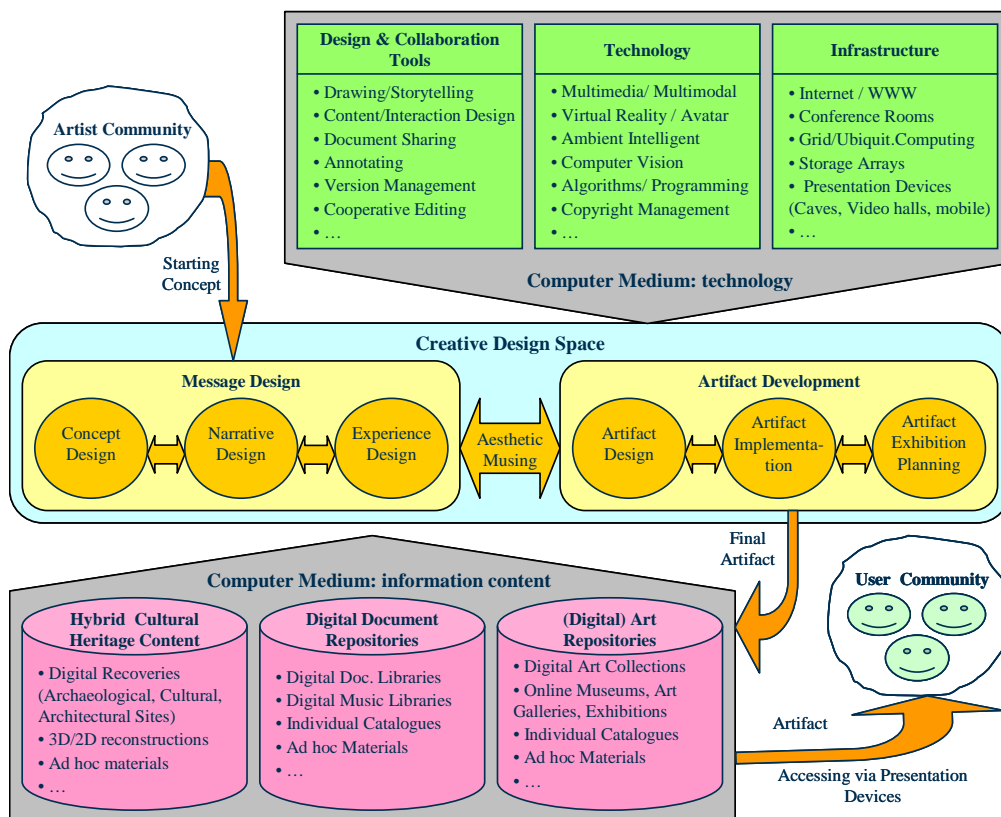


Figure 5. The Creative Design Space Architecture.

As a whole, the creative design space as depicted in figure 5 is not entirely affected either by technological advances or the needs of users and creators. The flow of work from one activity to another remains conceptually the same.

As previously noticed, the computer medium is likely to traverse all the stages of the creative design process, from concept drawing until the final artifact production and exhibition. As we can observe in the figure 5 the computer medium can be divided in two main lines of contributions, namely:

- **Computer medium** as technology: we identify here three principal types of tools:
 - Design & Collaboration Tools: they include all type of tools and applications that support activities related with design, drawing, planning, etc. as well as those allowing the collaboration among groups of artists to happen throughout communication, sharing of files, joint editing and annotating, etc.
 - Technology: we consider here all the computer technologies that are offered not only as tools or applications but principally as technological areas whose knowledge, procedures and techniques can be exploited in benefit of the creative design process. Programming languages, toolkits, specific algorithms, concepts and architectures, scripting techniques or procedures in areas such as virtual reality, computer vision or ambient intelligent are good examples of the technology mentioned here.
 - Infrastructure: this relates to all supporting infrastructures that make the computer medium to happen, in terms of communication, conferencing, storage facilities, computing capacity, presentation devices, etc.
- **Computer medium** as digitally coded information content: we identify here three principal types of information content:
 - Hybrid Cultural Heritage Content: this relates to all kind of content, partial or full digital, collected from different cultural heritage sources such as archeological sites, museum, 2D and 3D digital recoveries of architectural and historical findings, etc. Cultural heritage content has been serving as raw material for the shaping of digital artifacts that aim at transmit specific cultural messages. For instance, digitally altered photography is exploiting to a great extend digital photographs of famous paintings.
 - Digital Document Repositories: these relate to the more formal document repositories ranging from text and image documents, digital music databases, from institutional or personal catalogues and collections. This type of information content is adequate, for instance, to be applied in artifacts that explore more official information sources, as for instance, the ones based on narratives referring to historic, real-life elements (dates, names, events).
 - Digital Art Repositories: these relate to digital-born art objects, media, documents, etc. owned by art galleries, museums, festivals, art houses,

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individual or ad hoc collections that are accessible online. Under this classification we consider also all the artifacts generated within the creative design space that can be digitally stored.

Artists enter the creative design process by providing a starting concept. Then, all along the message design and artifact development phases, the artist may bring into play several types of tools, by a single manner or collaborating with colleagues, while using digitally coded information content. Incorporated in this information content we might have also parts of or complete artifacts. They can be, possibly, reused as simple musing objects or be even transformed into new forms. Thus, the management of copy rights in the accessing and re-use of digital content is a mandatory requirement for a successful development of the community of interest over the common creative design space.

Notice that the final artifact is released into the digital repositories and not directly to the audience. This is because the access to the digital artifacts has to be done by presentation devices within an exhibition space, being this physical such is a museum room or virtual like the Internet.

Discussion

We are aware of the risks behind the proposal of a creative development process model, when the phenomenon of artistic creation or creativity is still not explained at all. However, digital art is an art branch that relies intensively on the computer medium.

Digital art brought the *interaction* and *virtuality* (in the sense of the immaterial) in art, as artists explore new forms of involving the spectator in the artwork and enhancing the shift from object to *concept* in the form of the “virtual object”. This virtual object is usually seen as a structure in the process, sometimes dynamic and volatile, that creates expressive effects, stimulates emotions and perhaps feeling on the part of the spectator, who might become an active player when *interacting* with the artwork itself and changing it in unforeseen new shapes.

Furthermore digital artists often explore the concept of *combinatorial* and *strict rule-based* process inherited from the Dadaism poetry, as well as, *controlled randomness* to generate and activate instructions for information access and processing. This leads to the materialization of artworks resulting from pure instruction-based procedures as was the work of the American composer John Cage, whose work carried out in the 1950s and 1960s, explored extensively these concepts. Cage described music as a structure divisible into successive parts that could be filled by means of automatically controlled randomness and instruction-based algorithms. This open an infinite set of possibilities for creation.

On the other hand, the intensive development of the information society has implications in the widespread of huge volumes of rich multimedia content and their usage in shaping digital artifacts. One way or other, our civilization’ heritage is turning into digital format and, to a great extent, available for free. Design and processing tools are become common place and increasingly trouble-free thought they will integrate artificial intelligence in order to facilitate the creation process. Art shall become, in short time, a prerogative of everybody, granted the access to the computer medium. Therefore, the emergence of collaborating artists’ communities sharing a common informational and communicational space increases the need for concrete implementations of the creation

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process where people may work alone but also act in group by sharing ideas and content with colleagues linked over a common creative design space.

We have observed that regardless of the specific digital medium employed, the creation process is essentially the same. People start with a first idea or concept and go along all or some of the different creation process phases. Important differences between artists in their methods of realizing an artifact can generally be ascribed to the differing technical requirements of the digital medium. These differences are superficial and mainly related to the technical understanding of the specific digital medium and the related computer-based technologies.

In fact the most important aspect in the digital art outcome is the concept embedded in. The concept is what the artist wants to show to the audience, .i.e., it is this “about something”. The specific digital medium is the mode of expression or communication used by the artist to convey the concept at hand. It may be concrete, as in the case of an interactive installation, or ephemeral, as in the case of a sound recording or motion picture. Although copies of these latter works exist in physical form, they are not meant to be appreciated for their physical manifestation. Digital art may embrace ephemeral artworks that are meant to be appreciated in the dimension of time rather than all at once in space.

Thus, we can summarize the creation process in digital art as the application of an individual's concept to a specific digital medium or groups of media, by exploring the potentialities of the computer technologies and infra-structures along a set of phases that start in the design of the message and ends in the deploying of the final artifact.

We are aware of the complexities behind objectives to achieve normalization of art-based processes. Art is still dominated by subjectivity, creativity and non-quantifiable outcomes that are opposed to science objectivity and methodological replication goals. However, digital art is an art branch that relies intensively on the computer medium, thus the computing science. Consequently deconstructing the design process behind digital artifacts must open new avenues for the digital art analysis but even more important enhance community knowledge about replicable methods usable in the design and creation of new digital artifacts.

Conclusions and Future Work

In this chapter we have analyze and discussed ground concepts and definitions behind digital art, emphasizing how the computer medium is itself the tool and the raw material in its creation. We have presented a model for digital art creation that consists of a creative design process implemented by means of a common design space where digital artists can smoothly progress from the concept until the final artifact while exploring the computer medium to its maximum potential.

We have seen the creation process in digital art is essentially about design of the message and experience the artifact will transmit and allow, as also its implementation as a computational system or application.

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The computer medium affects here the role as the tool to enhance the creation process; as also as the raw material when the digitally coded information content and computer components are primarily explored in the shaping of the artifact. We have also stated the activity of digital art creation is mostly about collaboration among a multidisciplinary team. It requires a common communicational and informational space where the different activities of the creation process can be realized along with communication and collaboration facilities, as also, the access to digital information content and exhibition spaces have to be provided.

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