TRANS-HUMANITIES

Title : Digital Convergence and the Externalization of Intelligence

Author(s) : EIH Multimedia Research Team
Source : *Trans-Humanities*, Vol. 5 No. 1 (2012), pp. 5–26
Published by : Ewha Womans University Press
URL : http://eiheng.ewha.ac.kr/page.asp?pageid=book10&pagenum=060600
Online ISSN : 2383-9899

Digital Convergence and the Externalization of Intelligence

EIH Multimedia Research Team* (Ewha Womans University)

I. Introduction

The advent of the computer which can be considered as the 'defining technology' (Bolter, 1984) of our age has changed our lives in a fundamental way. In the midst of it is digital convergence. The concept of convergence can be applied beyond the digital-based computer media. For example, we can see a picture book as the convergence of words and pictures and film as that of images and sound. However, the current phenomena of digital convergence is not only limited to the dimension of the media but is a convergence of a comprehensive dimension that brings about an overall change in our culture. Digital convergence is differentiated from past convergences in its characteristics and size.

Henry Jenkins sees convergence as a phenomenon which comprehensively covers the union and flow of content across diverse media platforms, the social and economical interaction related to the production and consumption of contents, and the derived changes in the behavioral patterns of media consumers. He examines convergence by classifying it into the five realms of technical, economical, social and organic, cultural, and global convergence.[1] Of these, this study will focus on the dimension of technical and cultural convergence, and investigate the convergence principles of digital media, while questioning what sensual, cognitive, and cultural changes are being made

* The members of the team are Hyun Soon Cheon, Yunkyung Cho, Jaeyoung Gim, Hyesook Jeon, Hyunkyu Jung, Eunryung Kim, Soojin Lee, and Sangkyu Shin in alphabetical order.

1. Jenkins is opposed to regarding convergence as a merely technological phenomena and explains it in terms of industrial (the M&A inside the media industry), cultural (the complex movement between media contents transcending cultural areas), and social changes (the braking down of boundaries between producer and consumer, the interactions among consumers themselves, and participatory culture) (see Jenkins 3-16).

Trans-Humanities, Vol.5 No.1, February 2012, 5 - 26

through digital convergence in the ways to communicate, to understand, and to accommodate *information*. In addition, predicting the future direction of digital convergence on such a basis, we will examine what changes this will bring in our understanding of the relationship between the human being and the world.

II. Layers of Media and Digitalization as the Key Principle of Convergence

To understand the phenomena of convergence, we need to ask questions such as "What is being converged?" and "What happens through convergence?" We will try to provide answers to these questions by distinguishing three conceptual layers and examining their relationship.[2] In addition, we will see how digital convergence is different from the analog convergence of the past and what influence this will have on cultural movements.

1) Physical layer: hardware(chips), computer networks, wires and cables, the physical infrastructure of radio frequency, film, paper, canvas, musical instruments, etc.

2) Code-logical layer: linguistic sign or syntactic layer. It includes codes, programs, protocols, and grammars which involve the manipulation of signs. The digital layer in which digitization takes place through segmenting and numerically representing information also belongs to the code-logical layer.

3) Contents layer: layer of messages and meaning. Includes both an experiential layer in which an individual perceives sound, images,

2. Classification into three layers has been proposed by many people. The names for the three layers selected for this study derive from Benkler-Lessig. However, the characterizations of each layer and the interactions among them are our own. For other classifications, see the following table.

Benkler-Lessig	**Liestøl**	**Bell**	**Hayles**
physical layer	Hardware	material stories	what it is
code-logical layer	Software	symbolic stories	what it means
contents layer	Meaningware	experiential stories	what it does

(Liestøl 167-70; Benkler 561-63; Lessig 23)

> and letters as a sensation and a cultural layer as a form of life where these elements become united into contents so that they are produced, consumed, and distributed.

Each media or medial experience is structured into three such layers. These layers are meant to be a conceptual distinction, rather than an ontological distinction, for analyzing and understanding problems. In brief, the physical layer of 1) refers to the physical foundations at the level of hardware and the contents layer of 3) refers to the media contents that are daily experienced at the personal and social level. The code-logical layer is a kind of inter-layer which mediates and connects physical and content layers. We regard it as the key layer of digital convergence.

In relation to digital convergence, we can turn to the convergence which occurs inside both the physical layer and the contents layer. In the case of the convergence occurring at the physical level, the most noticeable is what in the past had been independent devices such as communication devices, music players, and video players have now been loaded upon one portable device like the iPhone®. The convergence we discover here is not simply limited to the fact that devices of various purposes have been merged into one. What makes such convergence possible is through the development of the semi-conductor chip integrating the technology which enables various electronic devices, such as transistor, condenser, diodes, and resistors which in the past had been connected through external wiring, to become fused into one chip.[3] If there had not been this convergence at the level of the physical layer, the digital convergence we are now experiencing would not have been possible at all. The chip convergence occurring at the level of

3. ENIAC which can be deemed as the world's first electronic computer was made using19000 vacuum tubes. It is impossible by using vacuum tubes to make a high-performance computer which may operate a rocket to the moon or connect all of the world's libraries due to constraints such as electricity, heat, or size. The advent of the transistor removes the limits in design related to electricity, heat, and size, but brought on the problem of "tyranny of numbers." To make a high-performance computer as above, 50 thousand to 5 million transistors and the same numbers of resistors, diodes, and condenser were needed. Even if there were no problems with the heat and electricity, there was no way to connect such a number of components into one circuit. The solution was the advent of the semi-conductor integrated circuit which placed all the devices onto one chip. For a more detailed explanation, see T.R. Reid's *The Chip*.

physical layer is the condition that enables the advent of integrated devices such as the iPhone®.

The convergence occurring at the level of content layer is the convergence of contents in which contents based on different media freely combine together. Of course, as we can see in film or picture books, convergence between different media is not limited to digital convergence. However, convergence between media in the past was what was taking place at the physical layer through the direct fusion of physical signals. Hence, the flexibility or the possible range of convergence was thoroughly constrained by the physical structures of the media. For example, in the case of a picture book, the physical shapes of letters or pictures are printed onto the physical surface of the paper. As for a movie, it physically combines magnetic signals carrying sound information onto analog-made image films.

This is because the content layer in an analog medium is strongly subject to the constraint of the physical layer (or its physical characteristics) on which contents are realized. That is, in the case of analog media, only sound, text, or image can be realized, saved, or delivered through the unique medium appropriate to their respective characteristics, and as a consequence, each medium exists keeping its independence from other media. For the purpose of saving, for example, a text requires a physical structure such as paper, sound requires recording tape, and picture requires a canvas. Therefore, the convergence of these media is based on the common features of the physical layers that they share.

In these traditional media, the code-logical layer is the layer which mediates and translates the content layer to the physical layer of the corresponding medium in an appropriate way. The information, story, or aesthetic beauty that we want to convey through a medium becomes concrete through manipulating the physical parameters of the particular medium. This means that the thoughts or experience, desire one wants to express at the content layer become mediated or translated onto the physical qualities of the medium in a certain way. However, such translation does not occur in an arbitrary way, but acquires its own grammaticality as a necessary technique or method develops and becomes standardized in accordance with each medium's physical quality or the content one wants to convey. It is these mediating rules that are populating the code-logical layer.

However, today's convergence between media is not the union of physical layers as of the past, but the phenomena occurring within the inter-layer which

is the code-logical layer. That is, the present day's digital convergence is in its essence not an incident occurring at the physical layer as like the advent of the computer (hardware), nor the mere union of diverse contents at the content layer, but is a phenomenon that reflects a revolutionary change in the grammar of inter-layer, i.e., code-logical layer. The code-logical layer is no longer the layer which just mediates and translates contents to the particular materiality of a medium. It has changed into a layer such that itself combines various media information. 'Digitization' is the driving force which has brought about such change.

Digitization is the reduction of information, contained in text, photographs, music, and video, into the combination of binary numbers of 0 and 1. This opens the possibility to reduce all sorts of various media's content to numerical information, neutral to certain materiality, and then to copy and recombine it in various ways. As a consequence, digitization enables the links, which in the past strongly combined a medium with a particular physical structure, to be dissolved to make a kind of neutral buffer, which not only alleviated the medium's dependency on the particular material but also opened up the possibility for a new hybrid medium. That is, as digitization features in the code-logical layer, not only has a new media much different from the past appeared but such a powerful and comprehensive change has been brought about that allows various combinations and transformations of content even for the past analog media.

The relationship between content layer and physical layer is that of realization. For an aesthetic experience, content can only be actualized through the intervention of a certain physical foundation. In the past, a physical foundation was not only the foundation which makes possible the experience of a certain content, but at the same time also a constraining condition. However, such interrelationship has changed with the intervention of a new inter-layer called the digital layer. We may now translate the content layer into a digital layer in a way which is free from the constraint of particular materiality, and then materialize it again on various physical foundations. No longer is a particular physical foundation necessary for a certain experience of content to be possible, as the identical experience can be actualized on multiple physical foundations. In other words, how content can be realized multiplies.

In the case of a movie or pictures, the content layer is 'adhered' to the physical layer such as a film or a canvas. In such media, the code-logical is

basically the layer of the rules to translate the content layer onto the physical layer and not the rules to transform or recombine the resulting product. After the content is engraved onto the physical layer by an artist or a film director, transformation is no longer possible or is put under considerable restraint. Thus, the distinction between the original and the copy is important and being burnt or physically damaged results in the disappearance of the whole (or at least considerable amounts of) content. This signifies how firm the connection is between the content layer and the physical layer.

However, such a situation has changed through the intervention of the digital layer. Contents are transformed into files of numerical data and can be reproduced through various physical devices or players. Also, they can be freely edited or reconstructed through various editing programs, and can be reproduced almost infinitely.[4] As Negroponte indicated, "The digital world is intrinsically scalable" and "the valuation of a bit is determined in large part by its ability to be used over and over again" (43, 77). The concept of 'multimedia' which has become so familiar to us refers to the combination of audio, video, and data bits. In its nature, it aims for the flexible transformation from one thing to another and the combination of heterogeneous bits. Such has become possible through the help of the digital which has newly been introduced to the code-logical layer.

This implies that even though the content layer should be ultimately actualized by the physical layer, its operating logic enjoys independent autonomy of its own. In the past, the physical layer imposed heavy constraints on the range of possible experience or on the ways of realization (actualization). By transforming content into digital data, it frees the work performed in the content layer from the limits of the physical foundation of media to a considerable amount. At the same time, it makes it unnecessary to follow the particular grammar of a medium for translating contents into the physical layer. However, the work performed at the level of content layer is not freed from all types of grammar. Although there is no need to follow the grammar for a particular physical foundation, it is now necessary to follow the grammar inherent to the digital layer, which is called a computer program or software. Empowered by such change in grammar, the possibility for new types of media or content is ensured.[5]

4. Lev Manovich explains such process in term of "numerical representation," "modularity," "automation," "variability," and "transcoding" (Manovich 27-48).
5. Another aspect of digital convergence is the divergence occurring at the content

On the other hand, the content layer is not completely freed from the physical layer. All processes of digitization requires a particular physical structure (called a computer) which enables such work to be performed effectively, so the grammar of the digital layer or the level of digitization can only be limited by the technological level of present day's hardware. Also, even if information has been digitized, for a certain experience or aesthetic sense to become actualized, it still must be represented with the help of some physical device. That is, for us to experience the text, music, or image stored in digital, they must eventually be transformed into an analog one. As human's sensory receptors works in analog, our experience requires appropriate physical representation. If a technique necessary for a certain (cultural) experience is not actualized at the physical layer, then it will remain only as an imagined possibility.

However, the development of hardware is also considerably led by the cultural need at the content layer. The basic motive behind the invention of paper, canvas, or film was the human need to make the experience of the related medium more effective. The situation is not so different in today's world. Many of the changes happening in the computer or communication industry are driven by the need to satisfy the various needs of users, not simply by the advancement of hardware technology. That is to say, only after a certain demand for a user experience being preceded, the development of hardware and its direction is controlled by the need on the level of software to digitize such demand.

III. Cultural Changes Accompanying the Interactions of Layers

The advent of a medium based on a certain materiality or the introduction of a new grammar (code or logic) related with it works as a powerful mechanism to spark a certain cultural phenomenon and universalize it at the level of the content layer. As pointed out earlier, while physical foundations are at times newly invented to satisfy our needs for media experience, the notable events of media history shows that the usual dynamics among the layers had proceeded in the opposite direction. The materiality of a medium

layer. That is, convergence as fusion does not end at a uniform culture or experience, but is led to the divergence of new possibilities (new genre, function, culture) which were impossible in the past.

and its grammar is not just a mere constraint for the possibility of experiences or for the range of potential culture, but works as a powerful motive to bring about a certain change in consciousness, behavioral patterns, and cultural style. That is, if a certain form of physical layer and the corresponding grammar have been established, a cultural change in some direction seems inevitable. Of course, to predict the direction of such change is not easy. Cultural changes caused by new media at times develop in unpredictable emergent patterns, seen in the perspective of the times.

An example that best shows the determining relationship between these layers is the change in civilization, which was caused by the introduction of the lettered text. As one of the most revolutionary events in media history, it transformed the oral language which depended on bodily means such as the mouth or ear into a visual object. In its basic nature, it was a change occurring in the code-logical layer. Objects constituting the physical layer of text developed from natural objects such as trees or stones to leather, cloth, and paper. Their primary role was to save a record of our thoughts and consciousness externally through visualized language. The method that humankind had first utilized to save one's thoughts was probably to draw pictures, as can be seen in the example of ancient cave paintings. However, with the advent of written text, there came a revolutionary change for the means of external memory. The most important aspect in such change can be discerned from the difference between the grammars of pictures and the written text. If the code-logical layer of pictures consisted of the rules to externalize the *image* inside one's mind onto an external object, the code-logical of the written text consists of the rules to visualize *conceptual* thoughts. Such change at the level of code-logical layer not only enabled us to record our thoughts more specifically but enforced changes in our ways of thinking, of constructing linguistic messages, and of communicating their meanings. That is, changes in the content layer were forced in accordance with the changes in the code-logical layer.

Cognitive skills in oral culture before the advent of written text presupposed a direct contact with things and were closely related to everyday life. Therefore, it was difficult for an abstract and analytical conceptual category to develop in such a culture and most knowledge was related to the concrete human behaviors of everyday life. However, as the rules of writing had been added to the code-logical layer, "It was possible to structure knowledge, maintaining a certain distance from everyday experiences." Writing and the further

advanced technology of printing had the role of "[reducing] dynamic sound to quiescent space, the separation of the word from the living present, where alone spoken words can exist" (Ong 81). The visualized records of written text produced a much more detailed structure and referential system than those of oral language, and made possible the accurateness, which was impossible with oral utterances. Furthermore, a change took place in the paradigm of experience. Auditory experience was transformed into a new sensual experience, the visual experience. In the culture of literacy, more value was endowed to the written text than verbal utterance, and the abstractness of concepts being visualized in writing were preferred over the concreteness of orality. Also, the written text enabled the new ways of thinking and items such as geometrical figures, classification through abstract categories, and formal-logical deductive procedures and definitions came to have important roles.

The advent of printing technology, the typewriter, and computer word processing are succeeding changes that occurred in the physical layer of written text. These changes in the physical layer in turn triggered the changes in the code-logical layer, as in the process of writing, and consequently brought about movements in human consciousness, knowledge systems, and cultural style. Kittler sees the advent of the typewriter in the 1900s as not only causing changes in the means or the process of writing, but also on human thought itself (215-48). The early typewriter, which appeared in the 1900s, differed from the typewriter of today in that the writer could not directly see what he was typing. This signified the separation between the eyes and consciousness. If one writes without being able to see what one is writing, as a gap between the writing behavior and consciousness is made, the writing is bound to become illogical and fragmented. This can also be predicted from the structure of the typewriter. As the letters are dispersed across the typewriter, the hands and characters also become dispersed. That is, while the hand is 'here,' the letter is 'there.' As a result, Kittler explains that if the writing of the past was a method expressing one's heart, the typewriter writing changed writing into the illogical and fragmented writing of 'telegraph form.'

The advent of the electronic media, which put an end to 'the Gutenberg Galaxy,' again altered our mindset and ways of perception. The incomplete writing of the 'telegraphic form' which lacked sentential integration, rather clearly revealed its nature at the advent of the digital computer. The producing of the lettered text in handwriting is basically the writing down

of the content somewhat completed in one's head onto paper. The extent for allowing changes as one writes is very limited, and if one doesn't start over, then such correction can only be made linearly. When seen from the aspect of modifying a materialized text, the typewriter does not differ greatly from handwriting. However, writing with the computer consists of first placing hints of various thoughts onto the computer screen, and then freely adding, editing, copying, and modifying the content through the parallel process of brainstorming and feedback.[6]

Digital media also changed the readers' experience through the introduction of a new grammar of hypermedia. The printed book consists of sentences, paragraphs, pages, and chapters according to the linear structure of the physical book itself. Of course, the reader can randomly open the book and read anything their eyes fall on, but the basic narrative cannot be freed from the closed structure of physically defined linear consistency. The hypertext changes the logic or story structure itself inherent in the text. More specifically, the digital networked-based hypertext induces the receiver (reader) to create the sense of participation through the various links within the hypertext and the narrowing of the physical gap between the transmitter and receiver. The concept of "interaction" becomes an important key notion. According to Pierre Lévy, "digitization reestablishes sensibility within the content of somatic technologies while preserving the media's power of recording and distribution" (49). Now, the producing and consuming of the text has been assuming a characteristic of dynamic discourse where the cooperative efforts based on the mutuality of many people renew it every moment, making its course of development unpredictable. The structure at this time is variable and non-linear, where the author makes decisions but readers can also decide for themselves.

When seen in this light, the form of communication in electronic media seems to have returned to that of the oral culture. However, such accommodation of orality and mutuality in communication results in a much richer experience and more diversity in the structure than those of oral communication. Ong calls such orality of the electronic media as "secondary orality" (133). In fact, the poetry, rhythm, and the phrasal repetition in popular music in the electronic media are similar to the phrasal repetition used frequently

6. As free modifications are allowed, that its product, the text, becomes to have a higher level of linear logic and accurateness seems very paradoxical.

in oral education methods, and mnemonics appealing to images is also in its prime in the electronic media age. However, this tradition produces a new structure as it combines with the characteristics of written text. Therefore, "it is essentially a more deliberate and self-conscious orality, based permanently on the use of writing and print, which are essential for the manufacture and operation of the equipment and for its use as well" (Ong 134).

IV. What Does All This Mean? Prospects on the Course of Convergence

Up to now, we have examined the structure of convergence and the interaction between the layers of media. However, the implications of digital convergence are not confined to the dimension of medium as like the advent of a new media, but are better considered in a broader view. Such a discussion may proceed by tracing what changes the new code-logic of visualizing language brought to western civilization, as can be seen in the following paragraph by McLuhan.

> The hidden cause of our Western bias toward sequence as "logic" [is] in the all-pervasive technology of the alphabet. ... Only alphabetic cultures have ever mastered connected lineal sequences as pervasive forms of psychic and social organization. The breaking up of every kind of experience into uniform units in order to produce faster action and change of form (applied knowledge) has been the secret of Western power over man and nature alike. That is the reason why our Western industrial programs have quite involuntarily been so militant, and our military programs have been so industrial. Both are shaped by the alphabet in their technique of transformation and control by making all situations uniform and continuous. This procedure, manifest even in the Greco-Roman phase, became more intense with the uniformity and repeatability of the Gutenberg development. Civilization is built on literacy because literacy is a uniform processing of a culture by a visual sense extended in space and time by the alphabet. (McLuhan 85-86)

We will try to examine the implications of digital convergence from a little different perspective by focusing on the interaction and the relationships between human being and machine, subject (agent) and instrument. Let us first consider the iPhone®, which is regarded as the icon of digital convergence.

What kind of convergence may we discover in the iPhone®? We perform various tasks with the iPhone®, which would have required various devices in the past. For example, I make calls, send messages, watch movies, listen to music, take pictures, search for news, and record personal data like phone numbers through my iPhone®. In this respect, the iPhone® is clearly the convergence of various hardware devices, and within it is a convergence between media such as music and image and various applications of communication, PDA's or personal digital assistants, and dictionaries.

However, convergence in a deeper sense of the word is that between 'me' as the user and the device of the iPhone®. If one considers a smart-phone like the iPhone® as the externalization of one's own cognitive processes (intelligence), there is a convergence between subject and instrument, between one's cognitive subjectivity and a device that assists or substitutes my cognitive activities. Contrary to just a few years ago, we have no need to memorize phone numbers or remember the many appointments of our daily schedules. We only need to press the search button on our smart-phone and save our schedules in our smart-phone, not in our heads. Other forms of memory media, such as our appointment books, have existed pre-smartphone. However, there exists continuity and difference. Continuity refers to the fact that much of our cognitive activities depend upon an external instrument, while difference refers to the point that the external device is no longer a tool in the passive sense, but has actively begun to get 'smart.'

We perform much of our cognitive activities through an instrument. That humankind has used external instruments to assist their cognitive activities is not a recent idea. It is not an exaggeration to say that the power of human civilization stems from the externalization (utilizing instruments) of knowledge (intelligence) and the cooperative efforts made possible by it. The written word enables us to objectify our thoughts (intelligence) onto paper or such external objects. This not only enabled the accumulation of intelligence on a huge scale, but allowed the massive cooperation in the production and application of knowledge which couldn't even be imagined in the tradition relying on oral transmission. For example, in the oral age, we could only communicate through speech and gestures and save the contents in our own heads. At that time, one person's knowledge was confined to what one oneself could think with the assistance of oral contact. And when the person stopped existing, much of their ideas would also disappear with their extinction. That is, the person's thoughts (intelligence) are closely connected to their existence.

However, with the introduction of written text, our thoughts gained a more permanent life. Even when we were not present or our existence erased, we could deliver our thoughts to others. Empowered by the development of printing technology, the mass reproduction and distribution of external knowledge made this process much more extensive and universal.

The influence that the externalization of knowledge through paper and pen had is not limited to the accumulating and distributing of knowledge. As can be seen earlier, it transforms the structure of our thoughts. The process of writing is, in a sense, a process of projecting the stream of thought within one's mind onto the external thing. Through this process, we can objectify our thoughts as if we were watching and analyzing a video. This process enables us to reach a level of precision, analyticity, and abstractness that would not have been possible if our thoughts had only progressed within our minds. In this sense, the complex, dynamic behavior exhibited by systems or systemicity and abstractness that today's scientific knowledge shows could not have at all been possible without the process of externalizing thought. Ultimately, the extensive systemizing, accumulating, and growth of knowledge are the result of performing cognitive activity through pen and paper.

Yet, if we put the indirect influence that instruments used in our cognitive activities have had aside, these instruments have not played a role beyond serving as a passive repository. However, as the digital layer intervened, now these instruments literally started to perform some of the cognitive process we have been doing. If we compare the process of doing calculations on paper with that of using the abacus or the electronic calculator, its significance becomes clearer. When calculating on paper, the actual calculation process will be done inside our heads. In the case of the abacus, what our brains had done is considerably reduced and the calculation process is transferred to the grammar in code-logical layer, realized by the physical structure of the abacus. In the case of the electronic calculator, we only need to input the numerical formula and all the processes of calculation will be performed at the digital layer of the calculator. We ourselves need not perform any calculations at all. That is to say, through digital convergence, the instruments that play the role of a human have gotten much 'smarter.' The smartphone is the present age's icon, symbolizing the 'intelligence' of instruments. Thus, the term 'smartphone' is not simply a commercial name but an appropriate name for the dimension of symbolic significance.

Then, is the smartphone really smart? Can an instrument become as smart

as a human being? Also, how should we define the relationship between humans and instruments which will continuously evolve towards greater intelligence? The release of the iPhone® has gained fervent response. Why are people so wildly excited about the iPhone®? Many experts point out that the success of the iPhone® lies not in the hardware but in the element of user experience. There are many smartphones which exceed the iPhone® in the performance of hardware, but these paradoxically required the users to get 'smarter.' However, the iPhone® has no proper manual and the interface that the user first encounters is only the home button at the bottom. The iPhone ®'s user interface is so structured that users can intuitively understand how to use it, without any special knowledge or skill. Here, we can infer what course digital convergence will take in the future.

Future convergence will ultimately aim for seamless user experience by removing the interface between human and instrument. It will reach a level we can deem as 'delegation' and much of our cognitive processes or abilities will increasingly be transferred to external instruments, signifying that the externalization of intelligence will proceed at a fundamentally different level from the past. Consider these words of Negroponte who had indicated such a course many years before.

> The challenge for the next decade is not just to give people bigger screens, better sound quality, and easier-to-use graphical input devices. It is to make computers that know you, learn about your needs, and understand verbal and nonverbal languages. A computer should know the difference between your saying "Kissinger" and "kissing her," not because it can find the small acoustic difference, but because it can understand the meaning. That's good interface design. (Negroponte 92)

Here, the disappearance of interface that Negroponte refers to will be ultimately reached through the convergence of the human and environment (or instrument). Personal equipment like the smartphone will change into wearable computers in the form of the clothes we wear everyday, and this will be used not separately but in connection to other ubiquitous devices on networks. These devices will not be operated with input devices such as the mouse or the keyboard but will be in the form of thought control, using brain waves as when we move our bodies. Then, we will feel as if these devices are a part of ourselves.[7]

What is most important here is that instead of simply making these

machines easier to use, they will be equipped with their own intelligence and perform the many things that humans could be doing. That is, the final course of externalizing intelligence is enabling the environment itself to become intelligent and make machines or the intelligent environment perform many of our cognitive roles. Such future human-machine interface is based on delegating one's authority to instruments so that they themselves handle things, not through human's direct operation. For example, the future software agent which acts as my proxy will just collect necessary data such as my emotion, tendency and purpose, determine priorities, and then offer it to me. For such a thing to be possible, the intelligent agent must 'understand' me and my surrounding environment very well. In this respect, the designing of such agent-based interface is ultimately the question of designing the future humankind, and the most effective interface will be actualized by combining human cognitive processes (mind), including sensory ones, with machine intelligence.

All this will be possible because the digital layer is the layer of realizing intelligence. For the intelligent environment or the smartphone to become actually intelligent, their physical structure must be able to respond to in a semantic way what happens in the content layer of our experiences and culture. This requires that the physical structure will somehow simulate or reflect the semantic content and structure. According to the computationalism of modern cognitive science, human cognitive process is essentially a computing process. One notable claim of theirs is the relationship between syntax and

7. Presently, pioneering research on thought control is being progressed as follows. Miguel Nicolelis is conducting an experiment in which he collects data on the relationship between the pattern of neural signals and particular movement by inserting 96 wires into the North Carolina Owl Monkey's frontal lobes and controlling a MIT Touch Lab's robot arm 600 miles away, through the signals coming out of the monkey's brain. This team's long term aim is the development of a practical interface where a paralyzed person can move his artificial arm and leg by just one's wishes. In the patient's viewpoint, the robot's arm and leg would respond directly as would one's biological arm and leg. Niels Biraumer and his team at the University of Tübingen have enabled a paralyzed patient to move a cursor on the computer screen using a device called TTD (Thought Translation Device). This is a non-penetrating method which senses the electronic signal SCP (slow cortical potential) given off by an electrode in the patient's scalp before a behavior. By trial and error, the patient practices how to purposely produce SCP and by selecting letters, compose a message. (See Clark 119-21)

semantics. Accordingly, what touches the physical layer is not semantics but syntax. As syntax is defined by its physical shape, it can easily be realized by physical structure. The translating of the digital signals of 0 and 1 into qualities of physical structure through electronic on/off signals is such a process. However, syntax can also reflect semantics simultaneously. That is, the computational operation based on syntax can be performed through semantic content or the relationship of the sentences.

If the claims are accepted, while the semantical relationship at the cultural layer is abstract, it can be combined with the physical layer through the mediation of the digital layer. In this case, the digital grammar layer to which syntax belongs is a layer that translates our experiences and cultural needs in the higher content layer, so that they can be realized at the physical layer. Here, the syntax acts as a handle with which semantics manipulates the physical layer. If the grammatical structure of the digital layer reflects the structure of intelligence, the physical layer of technology and its interface will become transparent, invisible to our eyes. This will fundamentally change how we experience our technology or machines. We will no longer experience technology or machines as a physical object as we do now.

Latour, who suggests the actor-network theory, is opposed to conceiving technology as merely instrumental, and contends considering technology as an independent actant (or actor) (Latour, 2006). His suggestion is to look upon non-human technology as an agent symmetrical to humans. As my behavior influences others and changes their behavior, technology can also influence people so that their behavior changes. In this sense, technology is not passive but must be considered as having a degree of activeness. If the environment becomes intelligent thanks to the help of a digital layer, then humans and the technology-laden environment will literally form the actor-network. The technology at this time will not simply be an objectified instrument. This technology will become a part of us or our environment as the air we breathe. Then even though the symbiotic relationship between humans-machines-environment will be constructed and defined by humans, it will redefine or constrain the potential of humankind at a fundamental dimension.

This kind of society cannot be constructed without technology, and human beings will make relationships with not only other human beings but with non-humans such as objects or technology. Such phenomena can be called the digitalization of cultural/experiential ecology. The environment of

urbanites differs from that of our ancestors in that the former includes the cultural dimension. This means that the problem of adapting to ecological environment-cum-culture, which modern urbanites must solve, is different from that of their ancestors. Similarly, the advent of the digital civilization will not only affects the appearances of our life, but will create an ecology of culture and experience radically different from that of the past. The empirical perceptional space of the elderly, who often do not know how to use a computer or the internet, is totally different from that of the younger generation, who grew up with the internet and electronic games. It is not much of an exaggeration to say that they are living in a disparate space and time. This is because the cultural/experiential ecology, which they face, has fundamentally been changed. In this sense, the digital technology and the digital civilization that it will bring about are not just external things outsides ourselves, but can be considered as constitutive elements of our own that define the fundamental part of our forms of life.

V. Changes in Identity and Remaining Problems

Digitization, which adds up to the convergence of human beings and technology, necessitates re-examining of the boundaries of humans, technology, instruments, and environments in a fundamental way. As the boundaries between humans (or cultural areas) and technology become unclear and the boundaries between self and instrument, subject and object become vague, a new defining approach of the self becomes necessary. Recently, there have been attempts to understand the human mind by extending it to the external world in philosophy and psychology. According to these claims, our mind or self is not an internal thing confined within our bodies. Also, devices like computers are not merely external instruments but constructing parts of ourselves or our minds, and in this respect, we are already a sort of mechanized cyborg. While there clearly is some exaggeration to these claims, the final judgment will differ depending on how we define ourselves and minds.

However, if we consider the self as a point of origin for the goals and projects we want to realize, the responsibilities we have to bear, etc. come together, then the implications of such claims become clear. Andy Clark names such self as the "narrative self" and explains its nature as the following.

> I think of myself not just as a physical presence but as a certain set of ongoing goals, projects, and commitments: to write a new paper, to be a good husband, to better understand the nature of persons, and so on. These goals and projects are not static, nor are they arbitrarily changeable. I recognize myself, over my lifetime, in part by keeping track of this flow of projects and commitments. Others, likewise, will often recognize me as a unique individual, not (or not only) by recognizing my physical shape and form but by recognizing some distinctive nexus of projects and activities. (Clark 132)

This narrative self is the self that is confirmed in our own and in another's mutual story. In other words, this is a self made up of what we and others think about our goals, projects, abilities, and potential. If this narrative self is one way to define our own selves, the narrative self of the digital age will be a sort of bio-techno hybrid combining our brains with the intelligent environment we depend upon. Through the advent of an intelligent environment, there would no doubt be a great change in our goals and projects, our ability, and our potential. For example, even in our present day, when we want to solve a problem, we rely on various external instruments. In writing this paper, we are using various books and articles, memos, electronic files, software, and search engines. Then, the engine that actually solves the problem is not just our brains but the matrix that includes various instruments, which offer such technical assistance. However, as the role of these instruments remains relatively passive at present and it seems to be our brain which ultimately exerts the authority to command, this phenomenon has not yet been perceived as existing on the boundaries of the self.

However, as indicated above, when our brains delegate the burden of many cognitive processes related to controlling our behavior to the intelligent environment, our perception of the boundary which divides the self from the environment will no longer remain stable. When our biological brain and the intelligent environment work closely and seamlessly together, it will be difficult to distinguish where a human's intervention to choose and command begins. Thus,

> It would be as someone tried to argue that the "real me" excludes all those nonconscious neural activities on which I so constantly depend relegating all this to a mere smart inner environment. The vision of the mind and self that remains following this exercise in cognitive amputation is thin indeed. ... The intelligent system that now confronts the

> wider world is biological-you-plus-the-software-agents. These external bundles of code are contributing as do the various nonconscious cognitive mechanism active in your own brain. They are constantly at work, contributing to your emerging psychological profile. You finally count as "using" the software agents only in the same attenuated and ultimately paradoxical way, for example, that you counts as "using" your posterior parietal cortex. (Clark 30-31)

All these discussions point to the direction where our self is no longer our brain but a hybrid of biological brain and technology (intelligent environment). Such a conclusion illustrates that the digital convergence currently in progress is not simply about the development of technology, but is concerned with a fundamental question about the 'human being.' If understanding the human self as a hybrid of the brain and the intelligent environment is an inevitable course, this will require fundamental changes to the conception of human identity on which who I am is identified with my body inside the skin, or to all the cultural, moral, political practices based on that conception. For example, when we want to hold someone responsible morally or politically for a consequence, who should we ask? Would the subject of responsibility be the 'individual' who is confined to the biological body? Or is it the hybrid fused with the environment? But is it a coherent idea at all to hold the hybrid responsible? Or is the awkwardness we feel for such an idea a legacy of modern western civilization, which had supposed a Cartesian self as being separate from natural order?

Also, we must ask if 'the delegation of authority to the environment' should be neutrally understood as just simply a useful utilization of science technology, or the subjugation to a new form of invisible power. An important political power that dominates future society will surely spring from a power dominating the network of humans and technology. In this case, to look upon the intelligent environment as a simple daily tool such as the present smartphone is an innocent idea. The question of how one will construct and maintain the network will probably be a key agenda related to the governance of society similar to the protection of democracy.

As noted earlier, a fundamental change at the physical layer motivates a new behavior pattern and an advent of culture much different from now. Likewise, digital convergence based on computer technology will bring about a certain irreversible change in our daily lives and cultural superstructure. However, scientific technology does not settle everything. Even if the

development in a certain direction is inevitable at the technical dimension, to determine what value must be respected and observed still remains as our share. The scientific technology of today such as digital convergence is, unlike the past, a technology that redefines and redesigns 'human being' itself. If humankind's origin was a product of evolution through natural selection, the evolution which will now take place is the process of selection for humankind by our own selves through high-tech science technology. The course of this selection of designing the future humankind will ultimately rest upon the results of deliberate reflections on 'what kind of being we ourselves hope to be' from the perspective of humanities.

Works Cited

Benkler, Yochai. "From Consumers to Users: Shifting the Deeper Structures of Regulation." *Federal Communications Law Journal* 52 (2000): 561-79.
Bolter, J. David. *Turing's Man: Western Culture in the Computer Age*. Chapel Hill: The University of North Carolina Press, 1984.
Clark, Andy. *Natural-Born Cyborg*. Oxford: Oxford University Press, 2003.
Jenkins, Henry. *Convergence Culture: Where Old and New Collide*. New York: NYU Press, 2006.
Kittler, Friedrich. *Aufschreibesysteme 1800·1900*. 4th ed. Munich: Wilhelm Fink, 2003.
Latour, Bruno. *Nous n'avons jamais été modernes. Essai d'anthropologie symétrique*. Paris: La Découverte, 2006 (éd. originale, 1991).
Lessig, Lawrence. *The Future of Ideas: The Fate of the Commons in a Connected World*. New York: Random House, 2001.
Levy, Pierre. *Collective Intelligence: Mankind's Emerging World in Cyberspace*. Trans. Robert Bononno. Cambridge: Perseus Books, 1997.
Liestøl, Gunnar. "The Dynamics of Convergence and Divergence in Digital Domains." *Ambivalence Towards Convergence: Digitalization and Media Change*. Eds. Tanja Storsul and Dagny Stuedahl. Göteborg: Nordicom, 2007. 167-70.
Manovich, Lev. *The Language of New Media*. Cambridge: The MIT Press, 2001.
McLuhan, Marshall. *Understanding Media: The Extensions of Man*. Cambridge: The MIT Press, 1994.
Negroponte, Nicholas. *Being Digital*. New York: Alfred A. Knopf Inc., 1995.
Ong, Walter. *Orality and Literacy*. London: Routledge, 2002.

Abstract

This paper examines digital convergence, focusing on its technical and cultural dimension, and discusses what implications digital convergence could have for our understanding of the nature of human cognition. For the analysis of the technical dimension of digital convergence, three conceptual layers are distinguished: physical, code-logical, and content layers. The dynamics of digital convergence is explicated by highlighting the role which the inter-layer, i.e., digitalized code-logical layer, is playing in mediating content-layer and physical-layer. For the analysis of cultural dimension of digital convergence, we invoke the notion of "externalization of intelligence," according to which the digital devices such as the iPhone should be viewed as being not so much mere passive tools as externalizations of human mind. Based on this thesis, we contend that the ultimate form of convergence obtains not between contents or hardware, but between the human and environment (or instrument). We predict this would cause a radical change in the way we understand the concept of agency and selfhood. For example, human agent will delegates much of her cognitive authority to a digital device that is an externalization of her mind, and the boundary of one's self needs to be drawn differently from the traditional boundary based on one's body.

Keywords: agent, digital convergence, externalization of intelligence, interface, self

EIH Multimedia Research Team consists of several scholars who are affiliated in different academic fields and are researching a new multidisciplinary approach to systemize and to utilize trans-boundary humanities. They are recently focusing on the issues about phenomenology of the screen, post-human transformation theory, and development of scientific technology and enhancement of human capacity to get a future prospect on post-humanism and the 'human.'

Submitted August 30, 2011
Reviewed November 29, 2011
Accepted December 27, 2011