A Developing Society in the Digital Age: Stimulating a Culture of Knowledge

Wilson (2004: 310) advocates that in order to construct a culture of knowledge (in developing countries), the first step is to establish awareness; awareness of the growing information system, the positive influences it has on everyday life and the simplicity thereof. The stigma around the complexity of information technologies should be eradicated by expressing a level of transparency. This must be followed by providing points of access. The nature of these environments should spark an interest and encourage a motivation to learn. But access alone is not the answer. In order to ensure that users make use of the access points, a second surge of encouragement is necessary. A realisation of the ability to contribute as well as the gratification of an individual’s contributions, needs to be fully understood.

The Age of Participation, as referred to by many writers and experts (such as Tapscott & Williams (2006), Mitchell (2000) and Castells (1996)), indicates that users are not merely consumers of digital content, but have in fact also become the producers. Don Tapscott, a co-writer of Wikinomics (Tapscott & Williams, 2006), has labelled this new ‘species’ of users as prosumers. In the book it is stated that while the Net Generation’s “parents were passive consumers of media, youth today are active creators of media and hungry for interaction” (ibid: 47).

It goes without saying that information spaces (or access points) should be places of participation and collaboration seeing as learners are encouraged by active engagement (Schön et al 1999: 161). In contrast to traditional educational systems, where information is transmitted by a teacher and the learner can either choose to accept or decline the knowledge, active participants have a hold over the process of edification (ibid: 269). This also creates a sense of responsibility. According to Schön et al (1999: 402) it is necessary to cultivate “an ensemble of values, expectations, norms, and incentives that impels more and more individuals to want to create and become active, engaged members in a knowledge society”.

The manner in which people innovate, explore and discover with technologies is predominantly influenced by this degree of peer-production or interaction. In essence, the following steps need to be taken in order to achieve a culture of knowledge:

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<tr>
<td>01</td>
<td>Create an awareness that dissolves the stigma</td>
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<td>02</td>
<td>Provide access points</td>
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<td>03</td>
<td>Stimulate interest among the society</td>
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<td>04</td>
<td>Interaction and creative learning</td>
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With the aforementioned steps in place the user has the opportunity to continue to an ideal additional two steps:

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<td>05</td>
<td>Self-education</td>
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<td>06</td>
<td>Innovation and upliftment</td>
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These steps need to be reinterpreted in order to be translated to relevant architectural guidelines:

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<tr>
<td>01</td>
<td>An informational building should be transparent and announce its programme</td>
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<tr>
<td>02</td>
<td>Physical access is an important consideration</td>
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<tr>
<td>03</td>
<td>The intervention should intrigue the public (by means of distinctive characteristics i.e. rendering a new spatial typology or form)</td>
</tr>
<tr>
<td>04</td>
<td>Encourage interaction</td>
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Figure 4.1: Diagram illustrating a network of information access points dotted throughout the urban landscape (Author, 2011)
Architecture in the Digital Age: 
+ A Paradigm Shift

With the increasingly evident impact of digital technologies on architecture, the design, manufacturing methodology and construction process is becoming dependent on and reconditioned by it. As representational tools change “[a]rchitecture’s definitive boundaries [also] transform” (Norman & Tilder, 2003: 5). Digital technologies are redefining conventional ideas of place, space and time, which raises the question: how will architecture be redefined?

In Differences: Topographies of Contemporary Architecture (1997: 117), Ignasi de Sola Morales puts forth that:

“Having abandoned the discourse of style, the architecture of modern times is characterized by its capacity to take advantage of the specific achievements of that same modernity: the innovations offered it by present-day science and technology. The relationship between new technology and new architecture even comprises a fundamental datum of what are referred to as avant-garde architectures, so fundamental as to constitute a dominant albeit diffuse motif in the figuration of new architectures.”

Even though computer-aided design (CAD) has supported the field of architecture since the 1980s, only in the last decade has it induced a significant paradigm shift within architectural thinking. It is unlocking formal and construction possibilities that has, until recently, been financially unfeasible and problematic to construct using traditional building technologies.
According to Kolarevic (2001: 117), the transformations should be profound due to new digitally driven design, fabrication - and construction processes contesting the historic architecture-construction relationship. He suggests that a direct link exists between the traditional drawing apparatus used, i.e. the T-square, ruler, and drawing compass, and the rectilinear structures of the past. When William Mitchell (2001: 358), the authority on the digital age, described the influence of the traditional architect’s tools on the building, he noted that architects drew what they could build and built what they could draw. With the advancement in CAD technologies, “digitally-driven design processes, characterised by dynamic, open-ended and unpredictable but consistent transformations of three-dimensional structures, are giving rise to new architectonic possibilities” (Kolarevic, 2003: 3). These ‘possibilities’ resulted in a new genre in architecture namely, digital architecture. It refers to architecture created via digitally enabled design processes, allowing complex calculations and forms that delimit architects to be created with great ease.

Computers and CAD technologies offer the three-dimensional freedom which motivate digitally generated forms that discard the conventional discourse of style. This technological means uncovers what other historic architectural tools have previously concealed – “the architectonics of architecture” (Mahalingam, c2003: 3). Non-Euclidean (topological, curvilinear and irregular) geometries are produced as effortlessly as Euclidean geometries. The plan is no longer the dominant design generator, while sections take on merely an investigative role. The validity of repetition and symmetry is negated as unlimited variability becomes as feasible as modularity and as mass customization replaces mass production (Kolarevic, 2001: 123). This technological progress in combination with the global energy debate has brought about the concept of ‘intelligent buildings’ that are energy efficient and environmentally responsible.

**Illustration 4.2 (1):** Non-Euclidean geometry: Photograph of Burnham Pavilion by Zaha Hadid Architects, Millennium Park, Chicago, 2009 (Litvin, 2009)

**Figure 4.3 (2):** Non-Euclidean geometry: Plan of Burnham Pavilion (Litvin, 2009)

**Illustration 4.3 (3):** Non-Euclidean geometry: Photograph of Burnham Pavilion by Zaha Hadid Architects, Millennium Park, Chicago, 2009 (Litvin, 2009)

**Figure 4.4 (4):** Non-Euclidean geometry: Sections of Burnham Pavilion (Litvin, 2009)
The theoretical discourse on the distinction between smart and intelligent buildings has been extensively explored by academics. A building is considered intelligent when it automates services or utilizes the latest technology (Hunt, 1997: 30; Sherbini & Krawczyk, 2004: 139). This type of building has computerized and mechanical processes that are predetermined and reacting strictly within a calculated action margin. It does not adapt to changing user needs or connect with users through a relational context (Hunt, 1997: 30). This misunderstanding of the term intelligent building often confuses it with smart buildings.

Intelligent buildings are characterized by modern-day computers that can assimilate and exchange information, correspond with other technology, and calculate responses. This can make the built environment think, thereby, gaining the ability to think about and process information. According to Sherbini & Krawczyk (2004:137), the concept of intelligent buildings arose shortly after an increasing interest in automated building systems. These systems communicate and exchange information to ensure a building's optimal performance in terms of economy and comfort. Building Management Systems (BMS) can regulate indoor air temperature, ventilation, illumination, security, and other aspects that need constant control.

Sherbini & Krawczyk (2004: 140) have listed the following criteria for a building to be considered intelligent:

01 | An input system that assimilates information by means of data receiver
02 | The capacity to process and analyse information
03 | An output system that reacts to the input (responsiveness)
04 | Timely responses
05 | The ability to learn

The modernist hypothesis of building as a machine for living has not yet been successfully reinterpreted into a 21st Century paradigm where the dwelling is viewed as a living machine (Hunt, 1997: 30). Cybernetician, Gordon Pask (1969), has been advocating for the symbiotic relationship between man and machine since the late 1960s. He suggested that there needs to exist an intimate interaction between cybernetics and architecture to create new psychological and physical environments. According to Sherbini & Krawczyk (2004:137), the idea of intelligent buildings was conceived shortly after an increasing interest in automated building systems. These systems communicate and exchange information to ensure a building's optimal performance in terms of economy and comfort. Building Management Systems (BMS) can regulate indoor air temperature, ventilation, illumination, security, and other aspects that need constant control.

"...responding to the demands of the physical... [while] interacting with the digital."

(Gaussa, Guallart, Müller, Soriano, Porras, & Morales, 2003: 345)
Cybernetics is the science of communications and automatic control systems in both machines and living things. The term autopoiesis refers to “auto(self)-creation” and was introduced in 1972 by Chilean biologists Francisco Varela and Humberto Maturana. From the Greek: auto (αὐτός) for self- and poiesis (ποίησις) for creation or production. An autopoietic system is self-governing and self-maintaining. It embodies the ability of component producing. In other words, the spontaneous generation of living systems.

One of Mitchell’s premises in *City of Bits* (1997) is that not only intelligent architecture, but intelligent public spaces should be decidedly receptive and responsive to the individual requirements of its users: an e-topia (Mitchell, 2000) of physical and virtual organisms. The primary precedent of this new discipline should be the evolutionary and interactive capacity of ecological systems and biological organisms. This could introduce an autonomous, holistic philosophy and systemic approach to the urban environment. The scientist, Richard Gardiner, believes that the answer lies in the “way that our synthetic world will be guided by the same philosophy as our natural world” (Hunt, 1997: 30).

In an architectural dictionary pertaining to this emerging paradigm, Gausa et al (2003) refer to this type of system as advanced architecture. It is “to the digital society what modern architecture was to the industrial society: an architecture bound up with interchange and information. With the capacity for displacement and modification” (Gausa et al, 2003: 36). It translates the ever-changing mutation of processes, context and situation into its associated spatial form; an architecture capable of conveying its own thoughts and movements, while concurrently exposing the agents that mould it. This creates a dynamic ecosystem that interacts with its biological, physical or virtual ecology; simultaneously “reforming...and recycling it” (Gausa et al, 2003: 36). This progressive nature demands qualitative change. Such environments are not limited by its complexity, but is rather given the opportunity to surpass all expectation by embracing waiting possibilities.

In John Frazer’s (1995: 10) writings on cybernetic architecture, he explains that:

“It will conserve information while using the processes of autopoiesis to generate new forms and structures...Not a static picture of being, but a dynamic picture of becoming and unfolding - a direct analogy with a description of the natural world.”

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01. Cybernetics is the science of communications and automatic control systems in both machines and living things.
02. The term autopoiesis refers to “auto(self)-creation” and was introduced in 1972 by Chilean biologists Francisco Varela and Humberto Maturana. From the Greek: auto (αὐτός) for self- and poiesis (ποίησις) for creation or production. An autopoietic system is self-governing and self-maintaining. It embodies the ability of component producing. In other words, the spontaneous generation of living systems.
Augmented Space

With the emergence of the Internet as an integral and ubiquitous part of daily life during the 1990s, the focus was turned to the virtual realm. This sphere was first perceived as ominous due to its underlying potential, but it soon became domesticated as an electronic suburb (as coined by Norman Klein). Recently, this focus has shifted back to the physical; the real world filled with virtual data and visual information. A new augmented reality (Manovich, 2011) is occupying the space where we once found the traditional city. This term refers to the overlaying of dynamic information over the physical layer of urban surfaces and spaces. This layer of digital media is no longer confined to flat static surfaces. This virtual-real relationship transforms physical space into data-space (ibid) by extracting information from the physical, reacting to it in the virtual and finally augmenting the real with a digital layer of information.

A complex multicity is created: a multitude of digital cities within the physical metropolis, creating a metapolis. Gausa et al (2003: 37) defines this in The Metapolis Dictionary of Advanced Architecture as “[a] city of cities conceived as a hyperplace: a place of places... A metapolis that would unfold on the territory as a flexible mesh of diverse landscape of spaces and interspaces. Grids, matrixes, topographies or fabrics.”

Electronic billboards and screens stand in contrast to this new breed of augmented space as it strictly occupies a predefined part of the physical realm (as in the tradition of Alberti’s window and the television screen) and is not overlaid in a three dimensional manner. Historic architecture has always incorporated information and symbolism if we consider ornament, iconography and visual narratives (such as ancient Egyptian hieroglyphics, Medieval cathedral windows, Gothic narrative sculptures and Ndebele patterns). Robert Venturi, the advocate of Post Modernism, suggested to George Legrady in a conversation (Manovich, c2006: 232), that architecture should return to its traditional definition of iconography where architecture should become information surfaces once more.

01. ‘Alberti’s window’ was a conceptual method for Renaissance artists to understand perspective. Leon Battista Alberti (1404-1472) wrote in his book, De Pictura (1435): “On the surface on which I am going to paint, I draw a rectangle of whatever size I want, which I regard as an open window through which the subject to be painted is seen” (Alberti 1991: 54). Here, it refers to the idea that information occupies a predetermined space within the physical world.
Illustration 4.4:
An illustration of the concept of augmented space in a literal manner - the city (Matsuda, 2010: 13)

Illustration 4.5 (1):
Photograph of ancient Egyptian hieroglyphics (Crystalinks, [2004])

Illustration 4.6 (2):
Photograph of Ndebele patterns on a hut façade (Author, 2011)

Illustration 4.7 (3):
An illustration of the concept of augmented space in a literal manner - the kitchen (Matsuda, 2010: 3)