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Design Creativity in Emerging Technologies

Abstract

Human creativity works best when there are constraints—pressures to react to, to shape, to suggest. People are generally not very good at making it all up from scratch (Laurel, 1991). Emerging technology, particularly virtual reality (VR) Multimedia, and the Internet, is yet to be fully discovered as it allows unprecedented creative talent, ability, skill sets, creative thinking, representation, exploration, observation and reference. In an effort to deliver interactive content, designers tend freely to borrow from different fields such as advertising, medicine, sport, fine art, commerce, entertainment, edutainment, film-making and architecture (Rafi, Kamarulzaman, Fauzan and Karboulonis, 2000). As a result, content becomes a base from which developers transfer the technique of conventional medium design media to the computer. What developers (e.g. artists and technologists) often miss is developing the emerging technology content based on the nature of the medium. In this context, the user is the one who will be the best judge to evaluate the effectiveness of the content. The paper will introduce Global Information Infrastructure (GII) that is currently being developed in the Asian region and discuss its impact on the Information Age society. It will further highlight the "natural" value and characteristics of the emerging technologies in particular Virtual Reality (VR), Multimedia and the Internet as a guide to designing an effective, rich and innovative content development. This paper also argues that content designers of the future must not only be both artist and technologist, but artist and technologist who are aware of the re-convergence of art and science and the context in which content is being developed. Some of our exploration at the Faculty of Creative Multimedia, Multimedia University will also be demonstrated. It is hoped that this will be the information which will guide future "techno-creative designers."

Introduction

The concept of convergence is frequently used to describe the development of the Global Information Society (Leer, 2000). In the early evolution of art and science, this referred to human creativity (Bronowski, 1976). However, as civilisation advanced and areas became specialised in the Modernisation Age, the dichotomy has resulted in the birth of both artist and scientist (or technologist) who work in separate ways. They started to realise that they could no longer be reached efficiently by relying on the separation but instead need to find ways to accelerate the process that could offer a "re-convergence" of art and science. It was suggested that the re-convergence was a result of new technologies that are widely found today in the Internet, Multimedia and Virtual Environment.

High-tech corridors in Asia

The announcement in the early 90's that a national information infrastructure was to be developed sparked a global use of information and communication technology (ICT) in developing countries, particularly Asia. This Global Information Infrastructure (GII) (Leer, 2000) covers four basic features, namely the Internet, Cable TV, Satellites and Telecommunications. It is hoped that this infrastructure will vastly accelerate the way we do busi-

ness, learn, explore, innovate, design, communicate, search, index and retrieve information. Below is the summary of the high-tech corridors infrastructure (i.e. Philippines, Thailand, South Korea, Singapore) as reported by Chong (1998) in PC Magazines Malaysia:
In the Philippines, the National Information Technology Council (NITC) has been given the role of leading and implementing the National IT Plan 2000 (NITP 2000) that aims at the "Smart Philippines." The focus area is in Subic Bay Cybercity where it links all government agencies, business organisations, educational institutions and households inside the metropolitan city.
In Thailand, the government has outlined the advantages of IT and opportunities to be gained from a national information infrastructure, a well-educated population and an adequate number of IT experts. More than 90 percent of Thailand's transmissions have benefited from digital mode transmission via satellites and fibre-optic cables. However, the country has suffered from lags in network utilisation, service, IT regulation and computer penetration.
In South Korea, more than a third of its 47 million population is hooked up to the Internet which gives them one of the highest ratios of Web access in the world. More than half of the population has cellular phones, and high-speed broadband access is accelerating far ahead of Japan. This is derived primarily from the Korean Information Infrastructure (KII) to promote universal access to IT and its services. The KII that is to be completed in 2015 focuses on information transmission (both wire and wireless), information distribution (i.e. via intelligent networks), information application and information use. In Singapore, "Singapore ONE" which was established in 1992, provides the country's IT framework with unlimited access to interactive multimedia applications and services to almost every residential, business and education establishment. They have invested more than US$19.4 million in the high-speed broadband network to reach all parts of the nation in Phase 1. This is supported in Phase 2 (US$30.5 million) where they introduced high-speed digital undersea cables to connect to the world and sustain broadband performance via coaxial (HFC) and Asymmetrical Digital Subscriber (ADSL) line.
In Malaysia, the IT initiatives and strong support by the government have propelled the country into sustaining and implementing the nation-wide idea of "Vision 2020" (to become a well-developed nation). The Multimedia Super Corridor (MSC) that occupies an area 15 kilometres wide by 50 kilometres long starts from the Kuala Lumpur City Centre (KLCC) down south to the new Kuala Lumpur International Airport (KLIA). Located within this Corridor are two cities known as Putrajaya (the new headquarters for the Malaysian Government) and Cyberjaya (targeted for IT and multimedia-based business, research and development centres, and universities, to name a few). Seven pilot "flagships" have been identified in conjunction with information and communication technology (ICT) application, namely Electronic Government, Multipurpose Card, Smart Schools, Telemedicine, Research and Development (R&D) Cluster, World Wide Manufacturing Webs and Borderless Marketing. It promises a 2.5 to 10 gigabits backbone network, fibre links, digital multimedia network and competitive tariffs. To date there are more than 400 MSC-Status companies in full operation such as Microsoft, Nippon Telegraph and Telecommunication (NTT MSC), Sun Microsystems Malaysia, Nokia, Motorola, and Ericsson which offer various jobs from hardware and software to content development. The Malaysian Government has also introduced the Entertainment Village Project (E-Village) where the main focus is on the creative supply chain (content development). The Cyberjaya area locates virtual studios, sound stages and post-production houses to be engaged with local and international companies as the key drivers for the future in areas such as skill developments, content controls and Intellectual Property (IP) Developments. These high-tech corridors and ICT initiatives have opened up the country to local and world-wide investments in areas such as education, research

and development, new business ventures and working opportunities, besides posing as the "digital divide" between developed and developing countries. The domestic demand for the "knowledge worker" has exceeded the supply of ICT professionals, and content-based developers. Bacani (2001) reports that there are 100 jobs in China for every computer-science graduate, Japan is seeking 200,000 IT professionals, Singapore universities can fill only 25 percent of 10,000 IT jobs per year and 210,000 unstaffed IT posts are forecasted in South Korea by 2005. According to a report in Asiaweek (Murakami, 2001), Japan has promised to spend US$15 billion over five years on information technology training programs and scholarships in Asia to bridge the region's digital divide.

Creativity in emerging technologies

All emerging technologies, having no precedent to follow, initially tend to copy the techniques of the technology they replace (Bridges, 1993). In fact, much evidence has shown that technology-driven methods and direct porting for content development often failed due to minimal awareness of the real needs, context and the overall content. The classic example was in the early 21st century when WAP technology was introduced. Almost every single games company expressed an interest to further develop the games in the existing cellular products, but then dismissed the idea (Rafi, Kamarulzaman, Fauzan and Karboulonis, 2000). There was no effort to search for a design within WAP constraints. In the end, only one, developed by Firesoft, was successful. They designed the "mobile games" based on the medium (WAP) constraints.

Creativity in Virtual Reality

VR has been well demonstrated, adopted and adapted in certain fields such as architecture, medicine (Barfield and Baird, 1998) and virtual prototyping (Robler, 1998), simulation training (e.g. flight simulation) which primarily concentrated in the area of representing reality or simulating real-life situation. However, VR has not been explored in-depth as a vehicle of interpretation and expression. The invention of film was initially seen as a way of documenting events but it required the artistic talents of great directors to turn it into the powerful communication medium that film has become today (Best, 1994). A new language needs to be developed in which programming and simulating will be as important as filmmaking, games, photography, storytelling and architecture. Many virtual world designs have been confused because the event created is depicted far more than real world design. What we need is a virtual environment that is worth entering and can increase the power and new abilities to think with plenty of interaction to be explored and learned. The greatest challenge for us is to prepare the VE content and put things into context. For this reason we should not design VE content to cater for everyone. Each participant will have his or her own specific experience, mental models or mapping, interpretations, and expressions. It would be an advantage if the user became more pro-active and were able to experience in this environment.

As Robler (1998) explains, some VR prototypes failed due to the lack of force feedback. There are several key techniques to sustain and encourage participants in VE. The most practical way to understand VE is to experience and "play" using the VR tools. A virtual world should be a place where an individual or multiple users are provided with a means of communication, creativity, productivity, mobility, and control over the shapes of their lives within the new information and media environment (Benedikt, 1991). As such, we should not simulate our real world, as many have done. It is possible to preserve some relationship to the real world without becoming dull (Best, 1994). What is important is to prepare a world in which the content could give new possibilities of learning, thinking,

exploring, and of being creative. The natural "abstraction" in a virtual environment allows endless suggestions to suit the environment for specific uses. A hologram, for example, creates this notion of allowing the participant to discover and visualise based on individual strength and point of view. It is important for the designers to plan the interactivity (e.g. the level and type of interactivity) and select features that maximise visual and audio impact. These features will be a reference point of interest and a cognitive map (i.e. landmarks, sense of place) to locate or navigate participants in the virtual environment. Besides, these elements have to reflect and accommodate stability and consistency in changing values such as position, colour and angle.

The Faculty of Creative Multimedia is currently developing a City Administration System (CAS) using Virtual Reality in an Immersive Collaborative Environment (ICE).

Three-dimensional (3D) real-time visualisation was adopted early in the project to help designers to search for the design problems that allow architects, clients, and consultants to freely move inside the virtual environment, gaining a real sense of scale, look and feel. Most decisions have been made while exploring the selection of material, spatial space, and layout which traditional techniques would have taken far too long to do and thus been uneconomic to employ (Figure 1 and Figure 2).

Figure 1: An aerial view shot of Putrajaya real-time simulation (courtesy of Faculty of Creative Multimedia, Multimedia University, Malaysia, 2001).

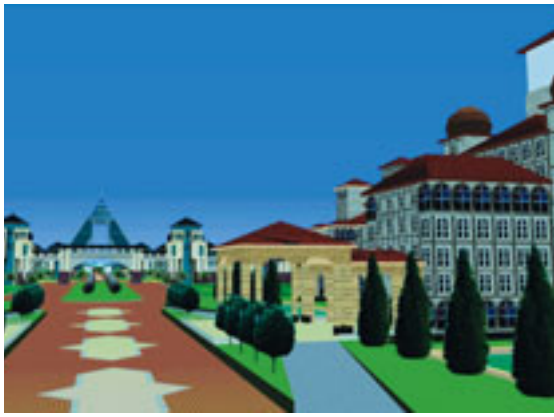

Figure 2: A ground level shot of Putrajaya real-time simulation (courtesy of Faculty of Creative Multimedia, Multimedia University, Malaysia, 2001).

Our second phase continues with a framework to control the city by suggesting elements linked to a database with three different characteristics, namely Static, Active and Dynamic. Static elements refer to fixed items or objects that are to be stationed at one place. Objects with an active nature change in accordance with the relative change. Dynamic objects change over a certain period of time (normally a certain input has been established to react to the given situation or interaction) as it will be automatically updated and remind the participant to react. The design also includes interesting features such as sound values and movement tempo.

Creativity in Multimedia

Multimedia have been widely abused in the implementation of content design and delivery of information. The Faculty of Creative Multimedia is suggesting a multimedia design platform known as "Palette of Wonders" (POW) (Rafi, Kamarulzaman, Fauzan and Karboulonis,

2000) that provides the multimedia design fundamentals, new insights, innovative ideas and explorations in the digital age (Figure 3). We have divided the platform into three different stacks, namely multimedia principles, elements and characteristics. We believe that multimedia are established on the principles of being digital and interactive. This paradigm shift has fuelled the convergence of different industries today. Without this combination, the content remains similar to analogue values. With interactivity embedded in multimedia content, it enables the user to a certain degree to control and acquire information. Designers have the ability to experiment and to explore the elements of multimedia in the form of text, image, sound, video and animation in developing the content. Never before have designers had the ability to match different media types and mix them into one coherent application (i.e. digital format) to convey information.

A combination of the principles and elements of multimedia is sufficient to form a multimedia content. However, it is suggested that with the adaptation of multimedia characteristics the content will be significant in terms of effective use, marketability, and impact on individual applications. These are time-based, collaborative and on-demand. Since in our daily lives we are used to motion-based situations (e.g. televisions or movies), it is suggested that multimedia designers consider this as one of the key features that easily relates to perception and thinking attributes. The availability of the Internet could be an advantage in preparing a "collaborative" design society and platform for the discussion, decision-making, cross-referencing, linking, retrieving, and distribution of data at any point of time and place. Because of the complexity of design and demand from specific users and applications, multimedia content design should give priority to only on-demand design solutions that could be developed, such as in the form of user or data-dependent, and video/audio streaming behaviours. Early encouraging results are demonstrated in our classes online and student contents design portfolios. The expanded version of the suggested platform has been implemented in the design of the "I-Putra" portal *(http://www.iputra.com.my)* together with one of the local content development companies (I-Design Sendrian Berhad) which will be launched in June 2001. It is basically a digital softcity of Malaysia's new administrative capital, Putrajaya. It is designed to be a fully interactive channel of content, context, community and commerce for the user to search, explore, and venture into business in supporting the intelligent city requirements.

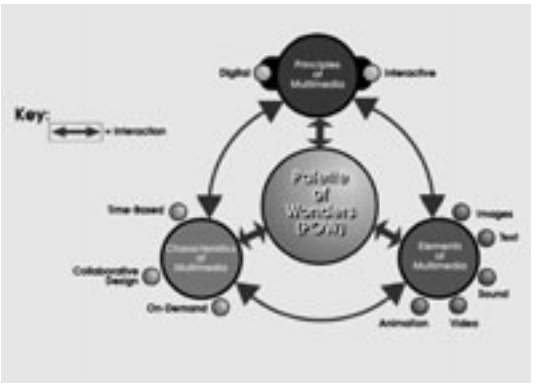

Figure 3: Palette of Wonders: A Design Platform for Multimedia (Rafi, Kamarulzaman, Fauzan and Karboulonis, 2000).

Creativity in Internet

The advantages of Internet have opened up and given particularly the developing countries and the world in general a transformation into "collective intelligence" (Levy, 1998) societies linked to digital communication. Companies such as Hewlett Packard's printing division, Java Business Network and Chrysler's Extended Enterprises have all greatly benefited from this "connected and networked" society. Apart from large corporations, the rapid evolution of border-less communication has also synergised between art and science expertise to form low-cost internet-based networks that in fact became a multi-

million-dollar company within a short period of time. Linux, for example, the non-profit making business that trades on information as its key commodity, expanded its community within three years and turned it into one of the best UNIX ever designed and developed (Malone, 1999). As regards the importance of ICT and Knowledge economy (K-economy) awareness and to reduce the "digital divide", the government has launched a national event for the general public to experience and explore the Internet and other training packages. The ICT Literacy Gathering on 17 February 2001 attracted more than a thousand participants to take part in a mass simultaneous computer tutorial prepared by the Manpower Department (Figure 4). A similar gathering was also held in all states in Malaysia. Certificates of attendance were given on basic word processing, spreadsheet, World Wide Web (WWW), building a homepage and how to use electronic mail.

Figure 4: A shot of the Information and Communication Technology (ICT) Literacy Gathering for K-Economy (courtesy of Manpower Department, Ministry of Human Resources, Malaysia, 2001).

In order to support this, the Multimedia University has ventured into "e-learning" as one of our primary research and development areas and investments. Our collaborations with Motorola University in early 1999 developed a few projects related to the new method of self-pace learning. One of the recent projects is demonstrated in Continuous Improvement and Strategies Methods (CIC101), a professional training package for the Motorola workforce worldwide. The team (i.e. digital artist, instructional designers and system analyst) have managed to give leverage to the Internet capabilities as an e-learning platform with multiple features for computer-supported collaborative learning. Animated instructions are used in certain areas to add values and assist learner's understanding and visualisation. The self-directed course enables the learners to track their progress, simultaneously allowing the instructors to evaluate at any point together with data-driven updates. Collaborative learning is made possible with the introduction of an "online discussion" room with close monitoring by the instructor (whenever necessary). This creative use of Internet was made possible with the integration of "knowledge sharing" between educators, artist, as well as technologist.

Conclusion

The convergence technologies are powerful and currently able to change the way we think, work, produce, react, innovate and do business. It is the responsibility of all professionals and individuals to apply and test the capabilities and form them into realities. The support from the government, sponsors, and financial bodies in this new venture is important to allow more participants to innovate new ideas. The nature of the "art" in the future would be applied and represented in different ways in the sense that "the artist" requires knowledge on both design as well as technology (net-based society). The way that individuals appreciate art could change the way they explore and respond as well as the way design is developed and marketed. It is recommended that all individuals are responsible for accelerating the process of the re-convergence of art and science in order to reduce the gap for effective and meaningful results.