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History of Game Technology and Design: From the Dawn of Video Games to the Mobile Age

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Masanobu ENDO

A game designer born in 1959. He is a graduate of the Department of Image Sciences (Photographic Engineering) in the Faculty of Engineering of Chiba University. After joining Namco Ltd. in 1981, he created the arcade games Xevious and The Tower of Druaga. In 1985, he founded Game Studio Inc. and became representative director. In 2004, he set up Mobile & Game Studio Inc. and became Chairman and Chief Executive Officer. He engages in development, design and production of a large number of arcade games, consumer games, card games and mobile games. His publications includes the science-fiction novel Xevious - Fardraut Saga and Denshi Game no Kairaku (Pleasure of Electronic Games) (co-written).

The Early Days of Video Games (1970s – 1980s)

INOUE: I hear you were so intrigued by Atari's games that you joined the gaming industry as soon as you graduated from university. After that, you started developing games in a wide range of domains, including arcade games, consumer games, card games and mobile games. In this interview, we hope to hear about the history of video games in Japan from the perspective of a game developer. Could

you start by talking about the early days of gaming?

ENDO: The history of video games began as CRT engineers and others started to build simple game machines. While there were some early examples such as Space War created at the Massachusetts Institute of Technology (MIT) in 1962, the first commercial success was achieved by the table tennis game Pong released by Atari in 1972. Pong used hard-wired logic, a system of hardware control instead of microprogramming. Atari's Super Breakout (1978) and Taito's Space Invaders (1978) were among the first video games mounted with central processing units (CPUs). Since then, software has been the key element in game development. Namco released Galaxian in 1979 and Pac-Man in 1980. They triggered innovation in graphics which we've seen improve continuously since.

INOUE: After the emergence of the video games you've just mentioned, in 1983 you produced Xevious and it was a phenomenal hit. How did you develop games in those days?

ENDO: Development of Xevious followed trends in the evolution of graphics. Until then it was basically standard to create a game with full graphics. But as graphics technologies developed it became sufficient to create images as "objects", which were later called "sprites", and to decide where on the screen they should be placed. Video game graphics are now produced like celluloid pictures for animation. In Pac-Man for example, Pac-Man and the monsters are sprites. For Space Invaders, full graphics were produced. All aliens moved at the same time. They shifted slightly while marching and this added some charm to the game. At that time, in games with sprites, the number of colors that could be used for a sprite was normally limited to four, including the transparent color. The same limit also applied to the game's background. As it was difficult to create the transparent color, many games adopted an approach of drawing lines in primary colors on a black background.

Around the time Xevious was developed the number of colors available for use in backgrounds increased and it became possible to use halftones. Eight colors were then allowed for sprites as well. While many game creators attempted to create various representations using eight colors, Xevious focused on single-color gradation. For example, changing levels of brightness is used to represent the rotation of an object. Xevious was a milestone in the sense that it demonstrated a different graphical approach. Another feature lies in the scroll. Although it was already a common

technology, Xevious featured the flowing full-color screen to provide a sophisticated image. It set a trend among video games with an emphasis on graphical features and storylines and it led to the Nintendo Entertainment System (NES) "Family Computer".

INOUE: I understand you were given a great deal of freedom in the development of Xevious project soon after your entry into Namco and the product was a result of doing whatever you wanted without being restricted by too many pre-existing ideas or rule about what form a game should take. This is similar to the experience of Tomohiro Nishikado, creator of Space Invaders in 1978, and of Shigeru Miyamoto, who created Nintendo's Donkey Kong in 1981. A series of these smash hits came from projects worked on by young creators. What do you think about the fact that these all occurred around the same time?

ENDO: In hindsight, I suppose that period was the key to success. The market supported works created by those who made somewhat unconventional attempts and were willing to use their imagination and try new things.

Mr. Nishikado is the type of person who thinks things through in a thorough, methodical manner rather than a type who comes up with entirely new ideas. He wanted to enable players to play more actively than in Breakout, where players attempted to break a wall of bricks lined up above their paddle. In this way, Space Invaders is an evolution from Breakout. It was excellent in that it opened new possibilities for video games with the use of technology and I think that is why it was such a big hit.

On the other hand, Mr. Miyamoto's background is in graphics. The character of Mario was the result of his quest to represent human motion. In order to express arm movements, he made the arms a different color from the body. That's why Mario wears overalls. Since the face could not be clearly depicted, he was given a large nose and a mustache to accentuate and overstate his profile. Mario first appeared in the arcade game Donkey Kong in which he was the hero with the mission of rescuing a damsel kidnapped by Donkey Kong. In a sequel entitled Donkey Kong Jr., released by Nintendo in 1982, Mario was, for a change, the villain who captured Donkey Kong. The current image of this character was established with Super Mario Bros. for the NES console, released by Nintendo in 1985.

I expect many developers would adopt the same methodology to represent arm movements and the face more vividly, but Miyamoto was the first to think of it.

Anyone could come up with the idea of using single-color gradation, sacrificing the number of colors in order to produce a 3D look as in my Xevious. It was only by an accident of time that I was the first to achieve this and that my product was a success in the market. Many of these things are obvious looking back, but we were the first to try them.

INOUE: In the world of video games you were probably the first person to give yourself the job title of "game designer" in Japan, although in the domain of analog gaming Ginichiro Suzuki's name cannot be overlooked. What urged you to introduce this particular job title?

ENDO: At that time, English loan words such as "design" and "planning" were not used in job titles. Instead, those who did these jobs were called kikaku personnel, programming personnel and things like that. Today, the smallest team of game development for cell phones consists of a planner, programmer, one person responsible for graphics and one for sound. But in the days of Space Invaders, a single programmer dealt with everything including sound and graphic design.

As you know, I was an Atari fan. Later, my games were licensed to Atari. When Atari engineers came to Japan they asked me about my job and I enthusiastically explained what I did. Dan Van Elderen, who later became Atari's president, said "That's game design. You're a game designer", that impressed me and since then I have had the title "game designer" on my business cards.

INOUE: That's a nice story.

The family computer video game market was created by the NES version of Xevious in 1984, and increased enormously with the craze for Super Mario Bros. in 1985, when you left Namco and set up Game Studio. Could you tell us what was behind this move towards independence?

ENDO: At that time, the popularity of video games was increasing rapidly; they had become a new trend. However, they were created in nearly the same way as industrial products. Both Namco and Sega were located in the Keihin Industrial District. This is not bad in itself. However, I felt that my sense of color and various other senses might become dulled if I remained in an industrial zone. As I began thinking of working at a place closer to downtown, Namco offered to support setting me up in an independent business. In fact, I felt I was no longer able to learn at the company and I launched a new office in Harajuku.

The prime of consumer game consoles (1980s – 1990s)

INOUE: I will widen the scope of my questions. You have been involved in game development for more than twenty years. During this period was there a time when it became obvious the market structure or approach to development was changing significantly? If there was a turning point, when was it?

ENDO: It was when consumer game consoles hit the market and brought video games to the general population. Another key factor has been cell phones.

INOUE: We will discuss cell phones later. Let's focus on consumer game consoles. In the mid-1990s, different consoles were released in succession: in 1994 the PlayStation from Sony Computer Entertainment, Sega Saturn from Sega and NEC's PC-FX, followed by Nintendo's Nintendo 64 in 1996. The media dubbed this "the next generation game console war." What did you think of the situation at the time?

ENDO: Video game graphics were quickly shifting to 3D. In the mid-1990s, I felt the need to produce 3D graphics. It was a very difficult period in many respects as the scale of development was already enormous. We raised money and assigned staff to develop games in short periods of time. Then we spent a huge amounts of money on advertising and sales promotion. That was the typical cycle of producing games during the 1990s.

For example, if a young team member with little experience suddenly proposed an idea during the early design stage they would usually be rejected. Even though they were interesting and sounded promising at the time many such ideas ended in failure. And because of this it was difficult to invest hundreds of millions of yen in them. Producers did not create games with their own money and they were prudent when it came to giving the green light. Game producers became more conservative and would not take risks on innovative ideas that might change the market in a new way. Unwittingly, producers began to create just a couple of safe game titles that seemed unlikely to fail. During that period, producers lacked confidence to create anything new. While some minor titles for the PlayStation platform demonstrated a high level of innovation, it was difficult to expect novelty from the major titles.

Another point is the change, for better or worse, was the change in the mode of distribution following the introduction of CD-ROMs. In the days of ROM cartridges, it took about two months to reproduce the game after any title went out of stock. That motivated both vendors and retailers to stock a large quantity of copies,

probably more than was necessary, at the outset. If any copies remained unsold they were put on sale at a lower price. Some consumers were happy to buy them at the reduced prices. It was a loss-making activity, but it helped the games proliferate.

With the introduction games on CDs it was much quicker reproduce the games and the volume of the initial orders was smaller. In an attempt to avoid risks, both vendors and retailers handled smaller quantities at the first delivery. As market demand is met by the reproduction of titles, games can soon loose the appeal they had just after the launch. For example, suppose a certain game title received an initial order for just one copy per retailer. The problem would be whether or not to produce any reprints after the delivered copy is sold. Retailers would hesitate to place an additional order as they would be unsure whether the ordered copy would be sold. They would rather choose to order several copies of a title in a better-known series. Retailers would feel like placing additional orders for a title if the three copies of it they ordered are all sold on the first day. I feel that disk distribution has ushered in the era where more and more slow-selling titles like the one selling only one copy are eradicated from the market.

As the market for video games moves online, the influence of stock management and retailers' behaviors on sales will diminish and distribution will undergo a revolutionary change. Online sales are now on the rise for Wii and other formats.

The Present (2004-2006)

INOUE: When this interview is published, the Wii console will be on the market. At the end of last year, the Xbox 360 was released. The PlayStation 3 (PS3) hit the market this month. In this new round of hardware warfare the three console manufacturers have adopted various strategies. How do you see this situation?

ENDO: I do not think that there will be a battle among them because their targets are totally different.

Wii proposes an interesting interface. Those unfamiliar with video games will accept its pointing device without any discomfort. On the other hand, quite a few experienced video gamers may find it somewhat odd and cumbersome. Wii and the Nintendo DS are both intended to attract new customers from an untapped market. So it has the right design. In that respect Nintendo does the same thing we do, we aspire to create something that attracts new players to games.

INOUE: Speaking of the DS, your company released Style Book, a software

title collection of lifestyle applications and games made for girls on the Nintendo DS. How do you rate the market created by the Nintendo DS?

ENDO: I think the DS is a new approach to the gaming industry. It has a personal quality. In the past, typically each household might have one game console and it would be connected to the television set. Girls might have asked their brothers, who tended to control the console if they could use it and play a game. Few households had more than one unit of the same game console model. However, the DS is owned by individuals, it's not shared. Unlike the Game Boy, the DS supports wireless LAN connectivity to enable connections between players. Even when four players play the same game title after it is downloaded from a single unit through the wireless LAN each player feels "it" belongs to them. Centered on this concept, the DS has a number of extraordinary features, including what is called the Touch Generation, which allows users to do many different things with the use of a pen stylus. It also supports voice recognition. Such features give the DS a strong sense of originality.

The novelty of cell phone games (From 2001 onwards)

INOUE: Earlier, you commented that the advent of cell phones was an important turning point. Could you tell us what facts typically reflect the significance of this event?

ENDO: First of all, cell phone games have a different customer base. Most game players are male even though the PlayStation 2 attracted many female users. The world of video games had been a male-dominated culture. In contrast, cell phone games are the first category in which the gender ratio of users is 50:50. Of course, some cell phone games are simply converted from existing consumer console or arcade versions and the majority of players of these games are still male. However, game titles without their console edition, which are available exclusively on cell phones, have as many female as male users, in fact, they have more female users than male users.

MORITA: Does this mean you are developing games targeted at women?

ENDO: Well, since the start of the twenty-first century, I have been working on the challenge of creating games for light users. I aspire to create games that are loved by those who play them for the first time. I am trying to create a game women find enjoyable. In the 1980s, I was already thinking of tackling this challenge. In the 1990s, it was totally impossible. In the age of cell phones, I can finally make something that women can play without

hesitation. In this sense, the cell phone platform is completely different from conventional game consoles and devices, although many people are still unaware this point.

INOUE: With regard to this difference, what about the problem concerning distribution you mentioned earlier?

ENDO: Cell phones have tremendous advantages in terms of distribution. They are connected to a network by default. People can buy games using simple operations from the phone menu. Whenever they feel like playing a game, users can download a new game even in the middle of the night. If a friend recommends a particular game, they can immediately download it and play it. I believe Tetris sold 20 million downloads. This exceeds the number of copies sold for home-use game consoles.

INOUE: Tetris sold 20 million downloads? That is an amazing figure. How is it counted?

ENDO: It is rather hard to determine an exact count. There are roughly two ways of enjoying games on cell phone: pay-as-you-go billing and membership subscription. When they download a game to play, users can pay either a flat-rate monthly charge or a usage-based charge. You can also sign up to a website that provides Tetris online and play the game there.

INOUE: I see. Now let's discuss the approach to developing games for cell phones. I have just played the Keshitairu game created by your company. I was impressed by its design based on the characteristics of the cell phone handset as an input and control device. For example, the keys are more suited to positively confirming an action by pressing them with a click rather than controlling a slow motion movement like those of Mario on the NES platform. I think that Keshitairu takes good advantage of this feature of the interface. What do you think is important in developing cell phone games?

ENDO: Well, first of all, games that place time pressure on the user are inappropriate for mobile gaming. Also, users should be able to play the game with one hand, so they can hold onto a strap or bar with their free hand while they ride on the train.

A game that has a time pressure goal might cause a player to miss their stop. And cell phone games should allow the player to remain aware of what is happening around them rather than totally capturing their attention. For example, in Keshitairu, nothing changes unless the user presses a key. When

changing trains, they can just close the handset before getting off the first train, after getting on the second train they can reopen their handset and resume the game from the same point.

Even if a game requires an operational action, for example to move a figure on the screen, I design it to work without the up and down keys. Cell phone handsets are normally held with one hand. In this posture, the thumb moves easily from left to right and vice versa, but it is uncomfortable to move up and down. I always make sure that all actions are covered by the left and right keys.

No matter how many times I repeat the importance of this point some game developers still create games that can only be played using both hands. In my company, we minimize the number of keys that need to be used. In our planning meetings, if anyone proposes a game requiring three buttons, other members reproach him or her saying, "That's too many!" [Laughter] Someone developed a game where a command is assigned to every numeric key and claimed it can be played when the player holds the handset horizontally. It is no good at all.

Connection between the Japanese video game market in early 1980s and the cell phone game market

ENDO: Let us get back to Tetris. Perhaps only in Japan women are enjoying playing cell phone games. Overseas it is more unusual for women in their twenties to play video games. Portable game consoles have a fairly long history in the Japanese market. Before NES, Nintendo released the Game & Watch which enjoyed commercial success. Those who are now enjoying cell phone games went to elementary school during the craze for Mini Tetris and high school during the Tamagotchi craze. Whether male or female, those who grew up playing these games do not find anything unusual about playing games on cell phones.

INOUE: I am also convinced that there is a great link between them. You have so far explained about light users and the distribution problem. Are there any other factors that pushed you into the cell phone gaming market?

ENDO: My company has some staff members who have been creating games since the early 1980s. At that time, it was a challenge to implement game applications with the limited memory capacity available and we had to come up with ideas to solve these problems. We still have expertise from this experience and therefore it has been quite easy for us to develop cell phone games. While other cell phone game developers may be

perplexed with the size limit of 20 kilobytes, which includes pictures and sound, those engaged in game development in the NES era regard it as just a little bit tight [Laughter]. For reference, the NES version of Xevious was 32 kilobytes. In addition, a high-level programming language can now be used. This is another factor that makes our development easy. When you do something new, it is essential to think of using the brain instead of massive human resources.

INOUE: In the early 1980s, there were several home computer magazines such as My-Com Basic Magazine and I/O that encouraged amateur game developers and many leading creators emerged from among these non-professional developers. In a sense, today's game industry is working to strategically to provide a similar environment to that of the 1980s where non-professional developers have the opportunity to make games. The XNA strategy for the Xbox 360 platform and the MOD movement are good examples. It is vital in helping latent talent to blossom from young game users.

I think it is becoming relatively easy for young people to embark on game development for cell phones. Could you name some interesting creators who are emerging from such amateurs?

ENDO: Our staff member, Satoru Okuda, was an amateur developer. These days his work is highlighted on international gaming websites. Originally, he independently created Java games. Importantly, the spread of the Internet has made it easier for young people to release their work in the public domain and for potentially a large number if users to appreciate their work. Many of these games still looks underdeveloped to the professional eye, but they become be increasingly refined as they are exposed to the public. Creators have a strong ambition to create something that will be shown on the Internet.

Future developments

MORITA: Do you expect any revolutionary developments beyond cell phone handsets to take shape in the future?

ENDO: I-mode applications were launched in 2001. In 1999, I did not anticipate such a large number of people would enjoy video games on cell phones. Anyway, I do not have the slightest idea of what the gaming world will be like in five years!

INOUE: Let me ask you a final question. You often say that frustration supports creation. Particularly, Family Circuit from Namco in 1988 was a product of

frustration. Is there anything that frustrates you these days with regard to video games?

ENDO: I love Number Place, which is now better known as Sudoku. But the existing application of this numerical puzzle game is very annoying. I am now working to create a frustration-free Number Place game. It is still at the alpha version stage.

INOUE: That sounds interesting. I would love to play it. Thank you very much for your time today.
(Interviewed on November 20, 2006)