

MR CHU: Thank you. I would like to start off by thanking the Central Policy Unit for the invitation. I was originally from Hong Kong, I left Hong Kong when I was 14 years old, it is good to come back with a different perspective, coming back to share with you what I have gone through in the last 15 years of experience in the game and 3D animation industry.

When we talk about digital entertainment, of course it is a very broad term -- and that includes the use of computer generated or simulated visual, sounds, music and interactive games. In this presentation I think I would focus on interactive games, so that I can give a reasonable discussion of this particular aspect of the industry.

During this presentation I would like to focus on four main points. One is to define the product. What is a game and what does game development actually involve? There are different career opportunities in game development, what kind of people do we need in order to sustain such an industry? And then we will look at the US video game industry and the current state -- and then finally I will share the experience with you about how we developed and delivered the game development curriculum -- with you today.

So, the question, "What is a game?" Is it a movie? Is it an interactive movie packed with the most intriguing story and the best graphics? Is it a software product, with the most cutting edge technology embedded? How is a game different from other software products; for example, word processing software, a spreadsheet? Microsoft spend billions of dollars developing such products -- packed it with -- a lot of features and technologies in there, but could it be considered a game? And then, who determines whether a game is a good game or bad game; and then, again, what makes a game a good game?

Well, first of all, we have to look at a game as a software product with a specific purpose. When someone sits down with a word processing program or a spreadsheet program, this person has a task to complete, has a job to do. But, when someone sits down with a game, the person has only one goal in mind, and that is to become entertained, to have some fun. So, a game has to be fun. And the problem is that there is no known formula for fun. Even the best game designers in the world, when they develop a new product or new project, they cannot guarantee that it will sell, because fun is a very subjective thing. The group on the left side of the room might think that certain things are fun and people on the right side of the room may

not think the same. So, the consumer, at the end, is the one that decides if a game is fun or not. Whether a game is a good game.

So what this game development involves is a very serious investment of time and money, that is for sure. A typical game development project in the US ranges between \$3 million to \$10 million to produce, and it not only involves programmers and artists, but it also involves people that can manage the budget; people that have legal expertise, who can make sure that by doing this project you are not infringing on other copyrights or other licences; you need people who can market the game, who can sell the game to the stores -- the shelf space is very tight at the retailers so what makes your product special? Of course it also involves the computer side; mathematics; physics; art; 2D, 3D computer animation and graphics; audio engineers; product testing, etc.

So, there is really a lot that is involved in producing a game. So the different careers involved are many. You need to have a producer who can look after the project from start to finish; you need designers who have a strong grasp of what are the fun factors in a game; you need technical directors who know all the sciences that go into a game -- the AI model, the physics model, collision detection, the game engine -- this person has to know everything about the technical aspects; you need programmers with excellent programming skills; you need people who have in-depth knowledge of mathematics and computer graphics; art directors who know the ins and outs of 2D and 3D artworks, who can integrate all the art assets that are needed for a game; and then you need the 2D and 3D artists who are the core groups actually to produce the graphics and the characters and the background, who also know about lighting, texture mapping and animation; and then, audio engineers who can input the sound effects and the music into the game.

So, the question is, is it worth it to develop such an industry? Well, let us look at some industry data. This is the retail dollars of the computer game market in the US. Pay special attention to the year 2001. It is a time when the US economy was going down, and when the economy was starting to come up again, we suffered a terrorist attack. So, the economy was in big trouble, but during that particular year the industry grew by about 45 per cent, and the reason was that people were less willing to spend money on big ticket items and travel. They would rather spend a couple of hundred dollars buying a few games or a game machine that they can play at home. Then in the year 2002, it went through another 10 per cent of growth. Later on we will also look at a comparison between the Hollywood industry and the

game industry.

Just a slide to show you how many units of hardware are being sold every year in the US. The red line combines the sales of the portable game machines, 99 per cent is the Nintendo Gameboys, and then the consoles combines the Xbox, Playstation 2 and the Game Cubes, as well as other platforms.

This one shows you, in the \$10.3 billion of sales in a year, how much of it is software, how much of it is accessories, and how much of it is hardware. You can see that constantly about 53 per cent, 55 per cent of the sales are towards the software. Actually, hardware manufacturers are selling their hardware at a loss in the hopes of selling more of the software games so they can make the profits later.

A brief look at the current profit share between the four different companies: Nintendo, Sony, Sega and Microsoft. Sony has a very open development policy, they allow many people to develop on the Playstation, so eventually their market share grew to about 57 per cent -- and Nintendo in 1991 had 83 per cent of the market, but by 2002 they are down to 27 per cent.

This one shows you for every games machine that was sold, how many copies of the software were sold. So, Playstation 2, again, sells 7.5 units of games for every machine that they sold -- and, actually, in the recent figures, Sony disclosed that they were losing money in the movie sector and the music sector, but the only sector in which they were making money was the game division.

This is a comparison between the motion picture business and the game industry in the US. Starting in 2001, it started to exceed the motion picture business by about \$1 billion. If you ask a group of teenagers now, in the US, "Would you prefer to watch a movie or to play a game?" about 80 per cent of them will tell you that they would prefer to play a game, and this is one of the reasons that contributes to this particular fact.

Now, DigiPen has some relationship with Nintendo. I would like to clarify our relationship here. One of the questions is always, "What is your link and your relationship between DigiPen and Nintendo?" We met with the President of Nintendo of America in 1991, and realised that there was a serious shortage of game programmers in North America. That is why they kept only a distribution and sales office in the US and they kept their development in Japan.

After the meeting DigiPen initiated the idea of starting a game development school, and they liked the idea very much but, of course, they were not willing to do any work towards that so DigiPen agreed to take on the task of developing a curriculum but we wanted them to support us with the proprietary equipment.

So in 1994 we started teaching a two-year programme, and based on the success of that program -- since companies were recruiting from us before the graduates could even finish their programs, we decided it confirmed that there was a need for such a school in the US. By 1996, video games had pretty much evolved from 2D to 3 dimensions, and therefore developing a game requires much more than dealing with 2D sprites and graphics -- now you are dealing with 3D simulations.

So the amount of knowledge required is more significant so we decided to start a four-year degree program, which is a Bachelor of Science Degree in Real Time Interactive Simulation. In 1998, seeing a number of graduates coming out of the school, Nintendo started a new company called Nintendo Software Technology, based in Redmond; and they started a company with about 42 DigiPen graduates. But, of course, the graduates that come out of DigiPen are not limited to working for Nintendo, and that was something that we made sure of, that graduates would have a choice to work for any companies that they choose.

Some facts about DigiPen Institute of Technology. We were the world's first school in offering such a degree program in game programming. We are authorised by the Washington State Higher Education Coordinating Board in 1996; and we are accredited by the Accrediting Commission of Career Schools and Colleges of Technology, which is a national accrediting agency recognised by the Department of Education in the US.

Our mission statement is to offer higher education to those who want to pursue studies in the interactive computer technologies, and to provide highly qualified personnel to sustain the growth and productivity of the interactive computer industries. So, we actually teach programs in 3D computer animation and game development.

A description of the real time interactive simulation as a case study: This program focuses on the techniques of game development, and we look at game development as a computer simulation with specifically games as an application. This program is very extensive and very intensive. Students at the school basically

spend about 13 hours a day at the school, six days a week; and they spend 4 years of their time studying this particular technology, and if you look at the course list you will understand why.

We have four departments. The Department of Mathematics -- they have to start from the very beginning, algebra, trigonometry, all the way through to calculus, to solid modelling; and then, later on, they have to study quaternion math, the study of curves and 3D space, wavelets, differential equations, finite element analysis. Basically, they are studying to become simulation engineers, to write programmes that simulate reality.

In the Computer Science Department you have yet another 23 courses or so, that teach them how to program in high level and loadable programming languages. They have to understand algorithm analysis, artificial intelligence, image processing, computer graphics -- which includes six levels of computer graphics and ray tracing, and they have to go through eight semesters of game production and the game production is meant to gel what they have learned in these classes into a practical example, practical application. By the end of the four years they will take these games away with them so that they form part of their portfolio in looking for employment.

A number of general education, A field course in computer animation that allows them to work with 3D animators and other disciplines. This industry is very exciting because it not only involves scientists, computer scientists, but also marries the arts and the sciences together. So, it is not enough to just know how to program, but you also have to understand the making of the arts, the story writing, and the various elements that are involved in game design. We also have a course in mythology for games designers.

Some employment opportunities for the graduates Today we place about 92 per cent of our graduates in the industry within 6 months of graduation. The companies that recruit from us are Nintendo, Sony, Electronic Arts, Iguana, Dreamworks Interactive, Lucas Arts Industry of Light and Magic, etc., etc., etc. Most of the companies are clustered on the West Coast, in Texas, and on the East Coast. Starting salaries of these graduates is between US\$45,000 to US\$60,000 plus benefits. Currently the demand for qualified game programmers exceeds the supply.

Our outreach programs to the high school students -- because we found that

those who come to DigiPen with a B average or an A average in math, typically still do not have enough real experience in mathematics and they are performing poorly in some cases. So we developed some high school programs that we actually teach at the high school level and basically we encourage them to study maths, computer science, 2D and 3D animation; with the understanding that if you learn these various topics you can actually involve them in a game production later on.

Then we also have summer workshops that give students, high school students an opportunity to have a taste of what it is like to do game development or 3D animation, and it has helped a lot of young people to find out whether this is something suitable for them or not.

So, at the end, I would like to thank you for your attention and I hope this presentation gives you some insight of how the game industry is in the US and how we can start something great in Hong Kong.