A STUDY OF HOW COMPUTER GAMES COULD BE USED FOR TRAINING AND ASSESSMENT PURPOSES

My study started with the premise that **computer games** would make suitable learning and assessment tools because they obviously deal with complex issues which game players must understand in order that they can play and complete the game. Other attractions of computer games were their popularity (a $3 billion pa industry in Australia, and $60 billion worldwide) and their capacity to keep a record of the achievements of the game player as the game progressed.

I attended a number of conferences, including the Independent Game Developers Conference in Melbourne, SimTech2004 in Canberra, the Tokyo Game Show and in early December, the Australian Game Developers Conference in Melbourne and its associated Academic Forum entitled “Playing With Our Minds”. I wish I had attended the “Serious Games Summit” in Washington in November.

The computer game industry and its devotees use a particular **language** (as do most industries) which is clear about what “gaming” is. Gaming is betting. Computer gaming machines are poker machines. State Ministers for Gaming control horse racing and gambling, not computer games. Computer game players call themselves “gamers’, and call computer games computer games! Gamers also say “mod” for modify, and use a number of other slightly modified terms.

It became apparent early in the study that there were **significant differences** between computer games and **simulators** on the one hand and **interactive learning products** on the other. A number of **tangible and intangible** characteristics distinguish games from the other two genres.

The easiest way to explain what sets computer games apart is the **immersion** of the player in the game. This means that the player sweats, becomes nervous, becomes happy, and experiences many other **emotions** as they play the game. Other media where this may occur include live theatre, movies, novels and even internet chat sites. Media or situations where this does not occur include teaching, instructional text books and instructional video/DVD/CD products. In games, the player is “in charge”, and free to go anywhere within limits, free to make mistakes and free to undertake non point scoring activities within the game as they play it. People familiar with computer games **“know”** if a product is a game or something else when they play it, irrespective of how “good” the game is.

In the transport industry, **simulators** are used for specific skills such as driving a train, flying an aeroplane or operating other equipment. These simulators are **highly realistic** and allow students to develop specific **skills** and some knowledge. Simulators may also immerse the player, but **they are not games.**

There are several genres of computer games, including **adventure games** and **strategy games.** Adventure games (eg Super Mario, Half Life, GTA) usually involve moving a character on a voyage of discovery, whereas strategy games (such as Sim City, Railroad Tycoon etc) are more concerned with decision making, and involve few if any moving characters.

Adventure games are often 1st or 3rd person "shooter games", irrespective of whether there is any shooting. In a 1st person game the player sees on the screen what the character they are controlling can see. In a 3rd person game the player can see the character they are controlling, as well as the environment they are in.

1st or 3rd person games lend themselves to **virtual workplaces** as well as to urban crime landscapes and mythical castles. With these type of games the character is not on a fixed "track", but can move anywhere within a 3-D virtual setting. The virtual setting could be inside an **office**, inside a **shop** (large or small), inside a **warehouse** (large or small, with or without forklifts), **outside** and many other places. The number of different virtual locations is not however as great as it may seem. The whole of industry is covered by perhaps only 20 basic virtual locations. Once a basic virtual location has been created in a game, it can be re-rendered, resized and modified further so that it is virtually unrecognizable in another part of the game. Within a virtual location, the character can be moved extensively, with certain activities undertaken in one part of (say) a warehouse, and other activities in another part.

With 1st and 3rd person games, the character the game player moves could do simulate the skills required to do a particular job. The game player would also learn, in playing the game the actual **knowledge** required to do the job. In other words, this type of computer game is a method of learning the **knowledge** component of a particular competency, where full **competency = knowledge + skill**. Real skill however could only be learned in the real workplace using real equipment, though the game may expedite this learning.

In Australia, we have a system whereby **over half of the vocational learning (and over half of the VET students and qualifications**) happens in the workplace via **flexible workplace based learning**. Flexible workplace based learning is underpinned by **Training Packages**, which consist of **units of competency**. Each unit of competency is made up of **performance criteria**, which are the actual things that must be demonstrated for competence to exist. In each performance criteria, specified knowledge and/or skill must be demonstrated. Under this system of "on the job training", the learner (who works) obtains their skills mainly from "doing", and their knowledge mainly from bits of paper they are given. Whether these bits of paper (also known as workbooks or learner guides) are the most effective way of adding knowledge to the on the job skill development that occurs, is questioned by this author.

It would seem that there is a case for learning the knowledge component of Training Package units via computer games, where learning is also from “doing”.

In most vocations (and therefore most Training Packages) the relative proportions of skill and knowledge weigh heavily in favour of skill at lower AQF levels, and heavily in favour of knowledge at higher AQF levels. Notwithstanding this, and perhaps seemingly paradoxically, the skill that is required at lower AQF levels is very important, and could well be learned through adventure style 1st or 3rd person “shooter” games designed for the purpose. The higher levels of skill required at higher AQF levels (say AQF IV, Diploma, Advanced Diploma) may be better suited to strategy games.

The Australian Training Package system provides perhaps 10,000 to 20,000 units of competency, and perhaps **1000,000 to 200,000 performance criteria** that could provide valuable **content** for computer games. The computer games I refer to here are real computer games which simulate the workplace. The computer games would have all of the characteristics of commercial computer games.

Australia has a comparative advantage currently over the rest of the world, which still emphasises the **teaching** of knowledge and to some extent skill. **As yet** the rest of the world does not have Training Packages or units of workplace competency**,** and therefore no content to put into a game…….unless the game was about school or college!

Computer games are a learning tool, not a teaching tool.

Using units of workplace competency, games could be designed whereby the player was confronted with a variety of workplace challenges, ranging from the interesting to the mundane. These challenges would be **based on actual performance criteria**. To be successful the player would have to simulate the virtual skills required, and demonstrate in a virtual workplace context **the actual knowledge required.** Some of the knowledge would be learned through doing the actual virtual task, and the remainder through peripheral things such as virtual workplace instructions, signs or other data. Computer game players learn a huge amount of information, but to date most of it revolves around fictitious dragons, wars or weapons.

The general idea for a computer game would be that it has several (say 5) virtual locations, with say 10 Training Package units within each virtual location, meaning a total of (say) 500 performance criteria, or specific challenges within the game. To gain a “virtual qualification” the player would select units according to the rules of the particular qualification they were doing, using the same rules

as the Training Package itself. It would not matter, that in making the selection of units, some units were not selected, because this is what happens with most real Training Packages.

As the player played the game, they would of course be **assessed** as they went, through the games capacity to **"save the game"**. An assessor could look at the disc or internet file later to assess knowledge, and then only need to assess skill in the real workplace.

Games of this type would allow the player to make mistakes, select the wrong units or challenges, to try again, and to have a little fun on the side. If the player made their character load the wrong combination of dangerous goods into a truck, then **the truck would explode** when it hit a bump! Better in a game than in real life!

During 2004 there has emerged a worldwide movement for "serious games". The games referred to are real computer games, but for a serious purpose. This does not mean the games cannot also be used for other purposes. Workplace games of this type would also have a careers information capacity, and a capacity to be used by gamers the world over……so long as words like Education and Training were not plastered all over them. Even then, a gamer knows a game, and may well play it, so long as it was properly designed.

Cost is a factor. Most games cost $3 million - $10 million to make from scratch. They are very labour intensive. Modifying an existing game beyond recognition is a much cheaper option. This option ("modding") requires the permission of the original game developer/publisher, but could reduce the cost of a good game to $200,000- $500,000. A steal!

There is little doubt in the mind of this author that serious games will become mainstream over the next 5 years. The only question is whether Australia will be a major part of it or not. Our current comparative advantage extends not just to units of workplace competency, but also to our own thriving computer game industry (approx 50 developers concentrated in Melbourne and Brisbane), which makes games for the world. The market is the world.

X,Y,Z generation people brought up on computer games will be no more attracted to pretend games or stick-figure games than Baby Boomers were attracted to hand duplicated sheets once the offset press and photocopier appeared!

Adrian Denyer
Flexible Learning Leader,
NSW Manager, TDT Australia, December 7 2004,
Attachments: FLL Press Release, Computer Game Storyboard

Australian Flexible Learning Framework

Supporting Flexible Learning Opportunities

MEDIA RELEASE

Friday 3 December 2004

Computer games get serious in Australia

Australia's AUD$3 billion electronic games industry could have a head start in the international race to develop 'serious games' by tapping into more than 10,000 workplace competencies currently available within the vocational education and training (VET) system through nationally endorsed Training Packages.

'Serious games' were discussed at the Tokyo Game Show Forum in September and the concept was introduced with a great deal of industry support and enthusiasm to the world stage at the October *'Serious Games Summit'* in Washington.

According to 2004 Flexible Learning Leader Mr Adrian Denyer, serious games should not be confused with other interactive educational e-learning tools.

"Serious games have the same ability as any normal computer game to emotionally immerse people in game play using adventure or strategy, but the difference is the subtly disguised intention that players will *learn as they play*, with progress checkpoints acting as a platform for knowledge and content assessment," Mr Denyer said.

Mr Denyer is researching Australia's potential to tap into the serious games market with support from the Australian Flexible Learning Framework's (Framework) Flexible Learning Leaders project, which has provided professional development funding to more than 200 Australians.

The Framework was established in 2000 to support the VET system to meet the rapidly increasing demand for flexible learning, including e-learning.

Mr Denyer says there is enormous potential within Australia to use commercial mainstream computer games as an exciting alternative training and assessment tool.

He believes that nationally endorsed Training Packages offer a significant potential source of material for game developers to draw on, particularly for trainers delivering flexible workplace-based learning. Game users, including school students, could also use serious games to explore career options by experiencing jobs virtually.

"The great thing about serious games is that people will have the opportunity to step into a job role and perform tasks that they may be unfamiliar with, or perhaps would never have experienced under normal circumstances.

"Competencies from Training Packages really give Australia an inside running in this growing global market because they cover all the activities required for a huge range of

jobs that are carried out all over the world, based on more than 10,000 very carefully defined units, and hundreds of thousands of performance criteria," he says.

"With around 50 game development companies located across Australia, additional corporate interest could make the option of using serious games as a delivery tool for Training Package units of competency a reality within the next couple of years," Mr Denyer says.

While some educational games do exist in Australia (one example is 'Ditto's Keep Safe Adventure', which was developed in collaboration with a number of Australian Government departments and the Telstra Foundation, to make children aware of personal safety and the danger of sex offenders), there are currently no serious games available that have the high level of interaction that Mr Denyer envisages.

"If we can develop serious games based on other popular computer games which are available for systems such as Sony Playstation 2 or X-Box, we may attract interest from a wider range of game development companies," Mr Denyer says.

In the computer game industry, there are two ways games can be developed. The first is to 'mod' (industry-speak for 'modify') an existing game. The second option is to develop a game from scratch.

"Some companies are keen to 'mod' because it's good publicity for them, and we'll certainly explore this option," Mr Denyer said. "In the meantime we are developing a closely guarded serious game prototype to test with game development companies."

Skills Councils work closely with the Australian Government and training providers to develop Training Packages. Mr Denyer is the NSW Manager of TDT Australia, the National Industry Skills Council for the Transport & Logistics Industry.

He believes the possibilities for simulating different workplace environments and on-the-job situations in serious games are unlimited.

"Either way, computer games will soon be a key part of how we learn things, especially things where we have to 'do' in order to 'learn'," Mr Denyer said.

According to the summary in a recent literature review 'The use of computer and video games for learning', there are several reasons why computer games can be beneficial as learning resources, including motivation via fun, instant feedback, responsiveness and the option to be uploaded and customised by individual players.

This month, the Australian Game Developers Conference will be held, featuring an 'Academic Summit' titled *'Playing With Our Minds 2004'*, where the issue of serious games will be discussed.

Scenario: Educating workers about occupational health and safety

Put yourself in the position of a future school leaver who is exploring their career options via a serious game…

Imagine that you have gained a position working in the shipyards in Australia's biggest sea port. You are responsible for protecting the 'front line' of the import and export industry against possible threats against this country and its people. You oversee the quality control and inspection of perishable and non-perishable goods that are to be transported to and from Australia on international carriers. Included in this long list are 'dangerous goods' that could pose a threat to the wider population.

You are getting dressed for work. What clothing is considered to be appropriate attire? Do you put on overalls, protective gloves and boots, or a suit and polished shoes?

To proceed past the first checkpoint and enter the shipyard, you need to wear overalls, protective gloves and work boots.

Once you enter the shipyards, you are greeted by a work mate who hands you a clipboard and asks you to inspect a shipping container from a vessel carrying 'dangerous goods', which have just arrived from a foreign port that is deemed to be a 'low security risk'. The container is due to be loaded onto a goods train destined for a highly populated metropolitan area in two hours' time.

Before unloading the container, would you use your initiative and follow workplace protocol to:

- read the paperwork attached to the clipboard?
- check your 'expected arrivals' list to ensure the cargo was registered?
- scan the shipping container before opening to check for illegal or life threatening content?

If the first task of the unit of competency is completed correctly, you will discover that despite the shipping container being correctly registered, it was used to transport an explosive device and the paperwork on the clipboard was a death threat from a radical extremist group. Had you not followed procedure, you would have breached Australia's line of defence and effectively caused a state of national emergency with potentially devastating consequences.

Failure to complete this task would be recorded as a failure for this assessment. Successful completion of the task would enable you to move on to the next stage of the game, by alerting national security. Despite being a very realistic simulation, the explosions experienced in the game are nothing compared to the irreparable damage of a blast that could occur in real life.

Mr Denyer will attend the Australian Game Developer's Conference, to be held in Melbourne from the 2-4 December. For more information or to register, visit: http://www.agdc.com.au/

For more information on serious games, visit: http://www.seriousgames.org

For demonstrations of serious games currently under development, visit: http://www.socialimpactgames.com/index.php

For more information on Flexible Learning Leaders, visit: http://www.flexiblelearning.net.au/leaders

For more information about the Framework's other products, resources and networks, visit: http://www.flexiblelearning.net.au

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For further information about this story contact the Framework Communication team's Susannah Thackray or Kristen Banks, tel: (07) 3247 5511 or email: flexenews@flexiblelearning.net.au

Compute Game Storyboard for Transport and Distribution Training Package Unit TDT E8 97 "Process Workplace Documentation"

1. **Location is workplace office with filing cabinet, desk with PC (keyboard and monitor), chair, and document tray on desk.**
2. **Person (in workers clothes) in a workplace office walks into the office and over to a tray and picks up a piece of paper and looks at it.**
3. **Zoom in on the paper which is a handwritten request for 5 tonnes of bananas to be picked up from BBF at Coffs Harbour and transported by March 10 to Super Fresh in Sydney by CFXPRESS. The note also states that "we have run out of forms", and is dated March 9, 2005.**
4. **The worker moves over to the computer and sits at the chair.**
5. **Zoom in on computer screen, and click on "create new form"(other options result in going back to the beginning) USING THE PC KEYBOARD THE "GAME" IS BEING PLAYED ON.**
6. **Form comes up on screen, with options for *accident report, leave application, transport of goods.* Select *transport of goods* (if other options are selected, forms appear, but cant be accessed without a password, which is not provided, so worker has to eventually select *transport of goods*)**
7. **When transport of goods is selected, it has boxes for *customer, provider, packer, transporter,* and *receiver*, as well as *for date, weight, delivery date,* and *"are these dangerous goods according to the Dangerous Goods Act?"***
8. **At the bottom of the form it has the words *select* and *don't select.* If *select* is not selected (sic), then words come up saying *"try again, do you want everything to be done for you?"***
9. **Once *select* is chosen, then the boxes must be filled in. The person doing this should fill in boxes for which they have information (*customer, provider, transporter, date, weight, delivery date,* and *Dangerous Goods*). If the correct information is not put in these boxes, or something is put in the other boxes (*packer* and *receiver*), then the whole form should shrivel up, and the words *"start again"* appear on a new form. Clearly the answer to the Dangerous Goods question should be "*no*".**
10. **If the form is completed properly, then words should appear asking "where do you want to send this?", accompanied with tick boxes for**

customer, provider, transporter, packer **and** ***receiver.*** **When any or all of these boxes are ticked, the words "*press enter to send*" should appear, and when enter is pressed a message on the screen should say *"workplace documentation completed".***

11. **Zoom out to show worker at chair. When worker gets up and stretches, then reaches to the tray again, the screen should fade to credits, titles, ads or whatever.**

Notes

The idea would be that the player can "create" the worker from a menu of options relating to size, gender, complexion/race etc, and various forms of neat worker dress. If for example thongs were selected, the worker may not be able to start, and a big sign saying "safe footware only" could appear. The player would move the worker into the office, and to the desk.

This is just one unit of many, and being an "officy" sort of unit does not have a lot of action compared to say loading a truck or talking to customers. It would be *important that what limited animation there was (person walking, then sitting down, and later stretching) looked good*.

In reality, or in full "game" several units could all happen in the office at the same time (other paperwork, IT or communications units).

With this example it is deliberately not obvious whether the worker is a driver, a warehouseperson, a manager, a supermarket or what. Depending upon what other units were selected in a "game" with many units, the worker might drive or maybe go into a warehouse after this activity, or may have come from driving or stacking or whatever before doing this documentation unit. A generic unit like this could be woven into a bigger "game".

Streaming video in boxes to the side could perhaps have scenes of bananas being loaded onto a truck, or maybe supermarket shelves marked "bananas" quickly emptying.

From a "game" point of view, a few extra twists might include a bin in the middle of the floor to move (otherwise trip over and be carted away in an ambulance), or maybe a loose wire sticking out from near a power point, which if touched made a huge noise, a red flash……and a hearse not an ambulance to take the worker away. If the loose wire scene was in, nowhere in the game would it be mentioned, let alone what would happen if the wire was touched. This would be left for game players to find out for themselves.

There could also be an EMPLOYABILITY bar, which got bigger as things were answered first time correctly, or shrunk if incorrect answers were given. Sensible dress might be a starting point for accumulating

employability points or maybe $s, where a person started on (say) zero dollars, but could go as high as (say) $100,000 !

This version of a game has elements of an adventure game, (bearing in mind though that offices are not very exciting places), and the interface of this unit with other units (which are at different levels, and different virtual locations), would provide opportunities for game play to be accentuated, and rewards/punishments provided.

The player would also be able to explore the office, or do anything else within the scope of the controls.