

## **Developing and using virtual work environments and serious games for people with special needs**

An introductory training manual for individuals and teams interested in developing serious games.

Dr Alex Woolner  
Serious Games Institute  
Coventry University  
2012

## **1. Introduction**

Serious games are becoming increasingly available as a resource for people looking for new ways to address existing challenges in many aspects of professional, commercial and social activities. A serious game is any application of games technology and methods for a purpose other than entertainment. The game can be based around digital technology such as video games, or analogue technology such as board games. The virtual work environments presented in the iSpectrum game are an example of digital games technology being used to create an interactive simulation.

As expected, there is already a growing body of work that represents the development of serious games for individuals or groups of people with special or additional needs. The breadth of requirements within this group is reflected in the wide variety of projects being delivered, with yet more applications emerging all the time. Taking this into account, this document will provide a generic framework of recommendations for anyone thinking about developing their own serious game for people with additional needs. This framework is underpinned by two key models, 'Iterative game design' and 'User centred design'. These processes are similar enough to be easily combined, yet have distinct purposes within the overall development of the serious game.

## **2. Iterative game design**

The development of a serious game can be broken down into four distinct phases

1. Conceptualisation
2. Prototype
3. Play test
4. Launch

The development team will iterate through the first three phases until a product emerges which meets their requirements and is ready to be taken to launch.

### Conceptualisation

This initial phase is for the development of ideas. Activities could include

- brainstorming sessions
- stakeholder meetings
- research into other projects
- clarification of the design question

Ideas emerging in this phase should be documented as part of the design process, even if they are later rejected. The database of ideas may be worth returning to later in the project or during future projects. For example, if an idea has been rejected during one project

because of a discovered flaw, this will be useful information should the same idea be put forward in a later project.

### Prototype

In this phase the ideas emerging from conceptualisation are built. Initially this can be a rapid process using paper and pen or other quick development tools, followed by more complex prototypes such as physical models and computer programs. Prototyping can reveal some fundamental flaw which means that an idea cannot be built according to its description from conceptualisation, and therefore should be either discarded or returned for further conceptualisation. Prototypes that can be built are taken forward for play testing.

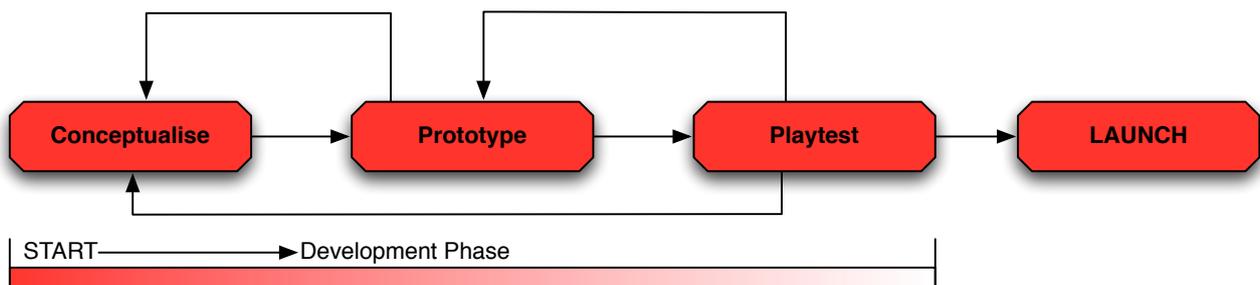
### Play test

In this phase the prototypes are tested for functionality and usability. Initially, testing may take place internally amongst the development team, amongst the wider project team or externally with potential users. Testing will reveal issues with the prototype that requires it either to be modified or rebuilt, and may well involve some reconceptualisation of the design.

### Launch

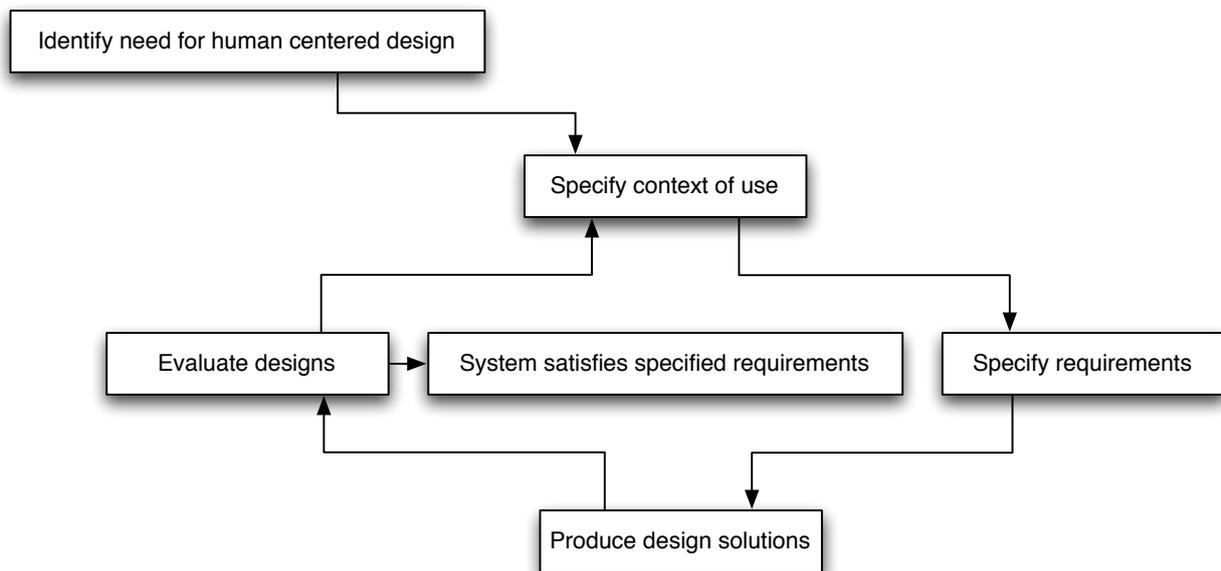
When the game meets the criteria layed out for it it is then ready to be launched. Typically members of the development team will liaise with members of the launch team in order ensure a successful launch. Games may require further development post launch to meet any unanticipated issues, or issues that could not be addressed within the prelaunch timeframe.

By taking an iterative approach, the team developing the game have the flexibility to introduce and test new ideas throughout the process. The team will continue to move through phases 1,2 and 3 repeatedly until finally moving to 4. The team are able to move backwards as well as forwards through the first three phases as illustrated in the diagram below.



### 3. User centered design

When designing a new product for users who have been identified as having special or additional needs, it is recommended that a user centred approach is taken in order to fully contextualise and understand the purpose of the new design. User-centred design (UCD) is a term used to describe both philosophies and methods concerning design processes in which the end-user has influence over the design of a product. Whilst this allows for a broad range of UCD practice, UCD is defined in international standard ISO 13407 : Human - centred design processes for interactive systems.



In this model, once the need to use a human centred design process has been identified, four activities form the main cycle of work:

#### 1. **Specify the context of use**

Identify the people who will use the product, what they will use it for, and under what conditions they will use it.

#### 2. **Specify requirements**

Identify any business requirements or user goals that must be met for the product to be successful.

#### 3. **Create design solutions**

This part of the process may be done in stages, building from a rough concept to a complete design.

#### 4. **Evaluate designs**

The most important part of this process is that evaluation (ideally through usability testing with actual users) is as integral as quality testing is to good software development.

The process ends, and the product can be released, once the requirements are met.

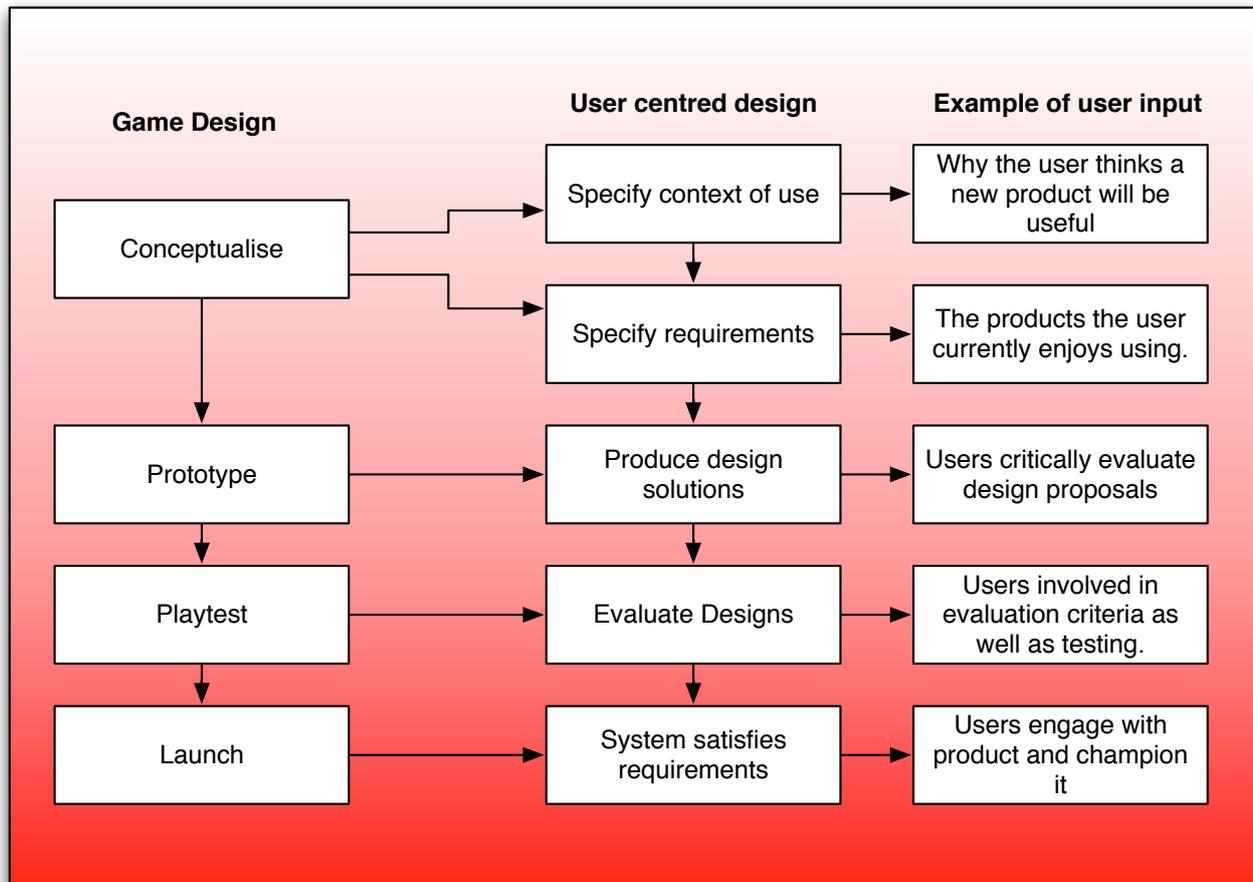
This iterative process underpins any serious game development project, and ideally involves the users at each stage. There is always a risk that the subjective and observational opinions of those designing for or managing the project will override the experience based opinions of the users themselves. One must always keep in mind that the success of the serious game hinges on the user's engagement with the final product. If the user has not been consulted during the design and development phases, this engagement becomes more unlikely.

For example, when designing a digital game for a particular group of people, during the conceptualisation phase it is recommended to examine how potential users currently use digital products and games, in order to understand what motivates and engages them. This can then help to underpin the development process. Attempting to encourage entirely new modes of engagement in isolation of existing behaviors is a far riskier strategy and may result in a product that is unsuitable and not of interest to the user.

It is also recommended that a focus group of users is consulted throughout the development cycle of a serious game. Each member of a development team has their own expertise, yet it is usually only the end user who is expert in the area being designed for. The risk for any project is that design decisions are made by other members of the team such as researchers, programmers or managers, when the end user may have a far more accurate perspective. Also if a project team cannot agree on a particular design decision, it should be deferred to the user group for advice. Good design will consolidate the opinions of all team members but should maintain the user experience at its heart.

#### 4. Combining Iterative and User Centered design

The following diagram illustrates how user centred design can be mapped to the game design process, allowing the two to co occur, with examples of user input during each stage.



#### Identifying the user

When identifying the user of a serious game, it is recommended that you consider all those who will be involved in the final successful delivery of the product. For example, iSpectrum is designed to be played by adults on the autistic spectrum with the support of a VETpro. Both of these groups are considered as users with their own specific requirements of the game.

#### Not technology centred

It is important to remember when embarking on a development project that is based around an application of technology, that the tool itself is not the end goal. Addressing a particular question or issue for the user is the goal, and how this is done is decided during the development phases. It is recommended that you do not embark on a project with a set technological solution in mind as this will limit the scope for best meeting the design challenge. Indeed, often when high tech and cutting edge solutions can be appealing, there is a simple and more affordable solution that better addresses the user requirements.

## 5. Designing the game

When designing a new game, it can be helpful to have some reference points from which to start. If you think that a serious game may be good way to address a particular question or issue that has been identified, the next step is to contextualise the idea. This happens during the initial conceptualisation phase and requires:

a.) Researching what already exists that shares similarities with what you have in mind.

For example other projects addressing the same issue. Or serious games that show how this issue might be addressed. It is important that you do not waste resources replicating an existing project,.

b.) Clarifying your ideas with the intended user group. This can give greater understanding of the question and bring to light any associated factors. You should pitch your ideas to the user group, who will quickly let you know whether they think you are on the right track or not. The feedback you receive will be very useful in shaping the early stages of development.

Both of these activities should help to inspire you with ideas to take forward for your game. With this initial research documented it is now time to start forming designs for your game. It is recommended that you take both top down and bottom up approaches to your design.

### Top Down

Define your goal. What is it that you want to achieve through employing a serious game? What are the objectives you need to achieve to reach this goal?

### Bottom Up

Define your user's experience. What is it that you want your player to think, feel and achieve when they are playing your game? What are the objectives you need to achieve to create this experience?

It may well be that there is some or considerable overlap between these two approaches though it is also valid if there is very little overlap. For example, if you were designing a muscle rehabilitation game for the Nintendo Wii, the goal and user experience may both include moving an arm in a particular way. The goal may also include specific information about the muscles used, the time spent playing etc. whereas the user experience may be more concerned with collecting magical items and gaining a sense of achievement.

By approaching the design in this way, there is more scope to flesh out what the actual game will be.

## MDA

Another way to deconstruct game design is to divide it into three sub categories:

1. Mechanics
2. Dynamics
3. Aesthetics

### Mechanics

The mechanics of the game create the rules by which the game is played. For example in snooker there are physical mechanics such as the table, pockets, cues and balls. And there are formal mechanics such as the sequence the balls must be potted in, the number of players etc. These combine to create the materials for the game and the constraints in which it must be played. Emerging from this is a set of rules that players follow that include understanding about how the balls will interact on the table, and how the sequence of play will develop. The mechanics of the game, whether physical or conceptual, are static. For example in snooker the table may be set out and the laws of the game decided, but nothing happens until play starts.

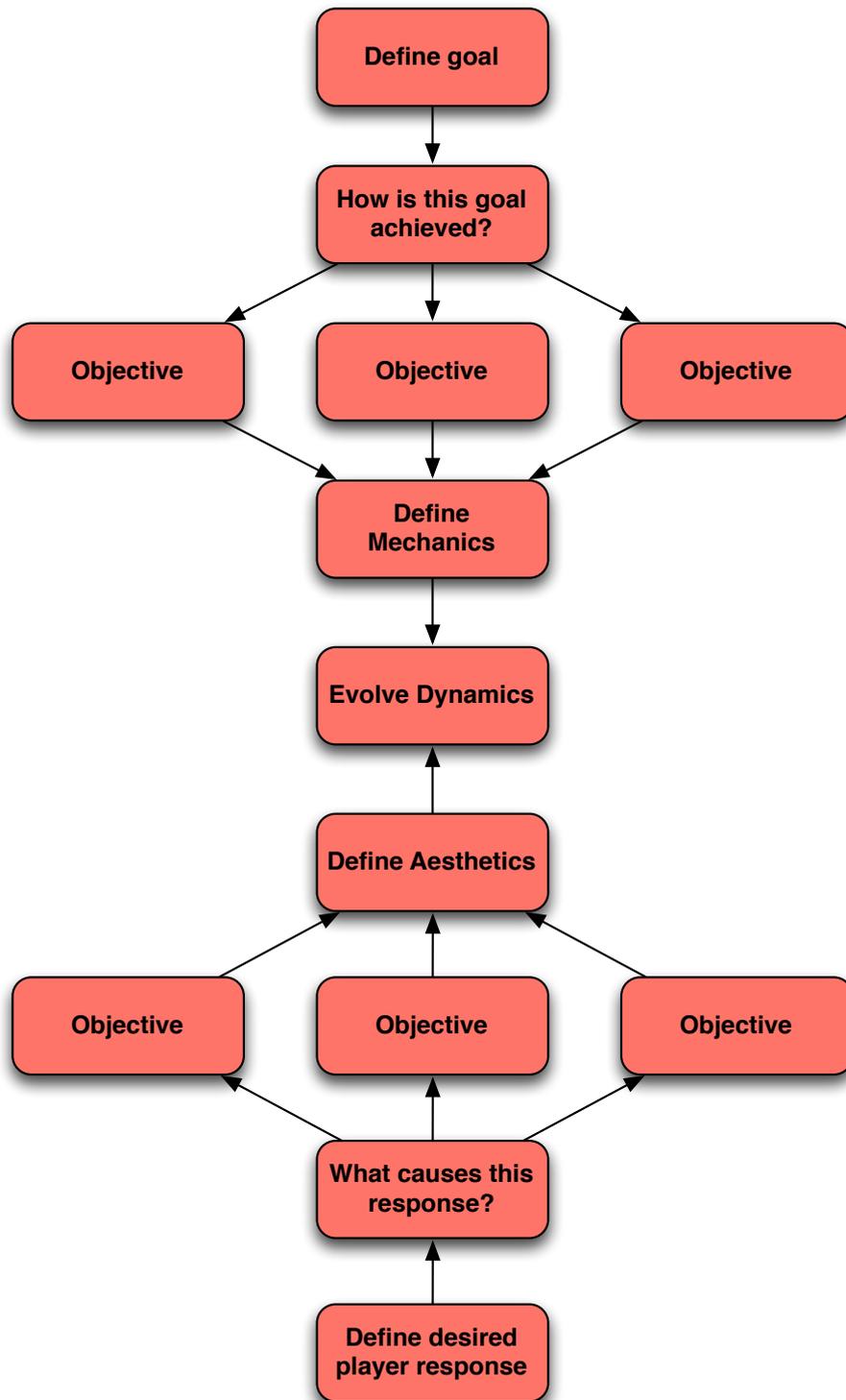
### Dynamics

The dynamics of the game describe what happens when time and movement are introduced to the mechanics. In snooker this occurs when the players start to play the game. The dynamics are an observable form of the mechanics in action. In games with very simple rules such as a child's board game, the dynamics of a game may be very predictable, especially if they are limited by simple constraints such as the role of a dice. If however a game is very complex such as cricket, with multiple players, or a modern computer adventure game with thousands of possible interactions, the dynamics of the game may be unpredictable.

### Aesthetics

Finally the aesthetics of a game describe the user experience; what they see and hear, what they feel etc. These are the elements that will decide whether or not the user chooses to engage with the game. In snooker this could be the challenge of a difficult shot, the thrill of beating an opponent or simply the enjoyment of hitting the balls.

The following diagram suggest how MDA can be used in conjunction with both top down and bottom up approaches to game design, with dynamics emerging in the middle as a result of the dual approach.



## **6. Resources**

Finally here are some suggestions for the types of resources that may be useful when embarking on a serious game design project for people with additional needs.

### **1. The Art of Game Design, A Book of Lenses.**

A book and a set of cards that can help free up creative and practical thinking when designing a game. The cards are available in printed form or free as an iOS or Android App.

<http://artofgamedesign.com/>

### **2. Serious Games Market.**

A current blog listing and commenting on developments in the world of serious games.

<http://seriousgamesmarket.blogspot.co.uk/>

### **3. ITAG conference.**

ITAG is an ongoing conference discussing Interactive Technologies And Games for Education, Health and Disability. It is part of the Nottingham Game City annual event.

<http://itag.gamecity.org/>

### **4. MDA: A Formal Approach to Game Design and Game Research**

A paper written by Robin Hunicke, Marc LeBlanc and Robert Zubek, which lays out their rationale for the MDA approach.

[https://sakai.rutgers.edu/access/content/group/af43d59b-528f-42d0-b8e5-70af85c439dc/reading/hunicke\\_2004.pdf](https://sakai.rutgers.edu/access/content/group/af43d59b-528f-42d0-b8e5-70af85c439dc/reading/hunicke_2004.pdf)

### **5. Game Accessibility**

A website that discusses and gives examples of computer games that are accessible to players with different disabilities.

<http://www.game-accessibility.com/>

### **6. Example Serious Games**

a. ReMission - A video game for young adults with cancer

<http://www.hopelab.org/innovative-solutions/re-mission%E2%84%A2/>

b. Circus Challenge - A video game for stroke rehabilitation

<http://www.limbsalive.com/products/>

c. Project Spectrum - An interactive classroom for children with autism

<http://projectspectrum.co.uk/>

d. Snow World - A virtual reality environment for burns victims

<http://www.hitl.washington.edu/research/vrpain/>