Gaming as a vehicle for collaborative design

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Introduction

> *'Few would disagree with the aims of the Bruntland report or with the pronouncements of the Rio summit. The problems come in turning the lofty aims into local action.' (Mackie, 1995)*

Despite the mass of literature concerning sustainable development it is clear that sustainability means different things to different people (Pearce, 1989). Agenda 21, with it's embodied ideas of sustainability, advocates community involvement but when design team members hold fundamentally different understandings of what sustainability means, working towards a common goal becomes an unachievable Holy Grail. If the collaborators are not able to distinguish between projects which enhance and projects which damage local sustainability, they will not be able to implement the intentions of the Rio Agenda.

We think that debate and decisions taken by local groups wishing to implement sustainable development will be improved by better ways of talking about sustainability, which will guide their action, and a criteria for local projects (Mackie, 1995). We believe that the route to better ways of working can be accomplished through an improved understanding of the interaction of the three vertices of the decision triangle; economy, community and environment (United Nations report, 1986).

This paper outlines one approach to addressing the problem of participation in a properly understood process and goes on to show how the principles used are being reinforced by an interactive computer based application.

The Model

Policy makers, overwhelmed by the complexity of sustainable development issues

often assume that any model used to tackle the problems of such development should be equally complex. However, Mackie (1990) has shown that is possible to create simple models of complex problems. Following a number of years working with communities in the UK Mackie has developed a model that helps to establish criteria for judging the relative merits of development projects.

The model is a 'three-capital' model contained within an apparently simple 3x3 matrix (figure 1). The first capital, or *stock*, is the environment and reflects the preservation of natural resources in the area, the middle column is concerned with human issues and registers the quality of life, the third column looks at the state of the local economy. Each of the *stocks* is described within the matrix as either being robust, stable or fragile.

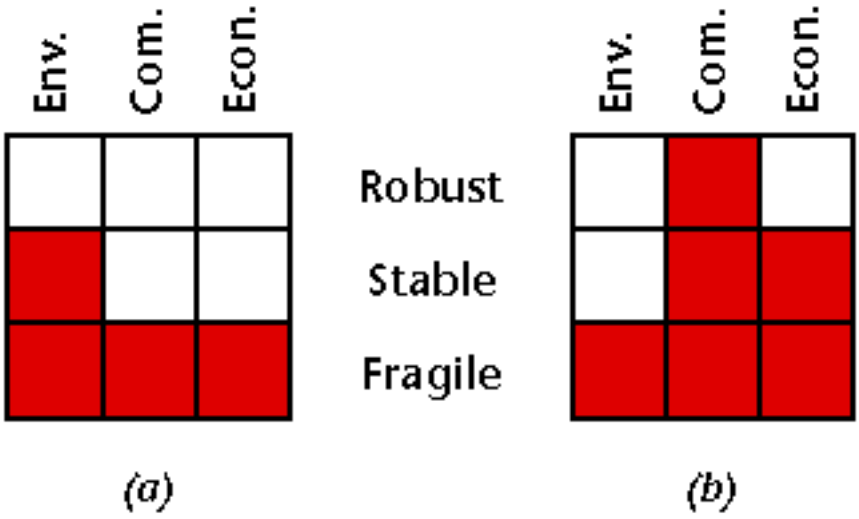

Figure 1. The three-capital model with (a) a stable environment, a fragile community and a fragile economy and (b) a fragile environment, a robust community and a stable economy.

The model has been used in community participation exercises in four ways; three games (a board game, scenario generating game, a game for assessing real situations) and the children's Eco-city project

The 'Games'

The first game, the 'Sustain Game' is a board game used to familiarise communities with some basic principles of sustainability and with the model as a way of thinking about these. This game is the focus of this paper. The 3x3 matrix is used as a board and the initial status of the environment, community and economy (the *stocks*) is either set randomly or pre-defined. Once teams know the starting positions of the *stocks* they create a fictitious scenario around these and decide upon the issues they think important in their own 'virtual' area (by this we mean a community and it's environs).

When the game proper starts teams are presented with a possible *project* in the form of a playing card (figure 2), this card indicates whether the project will raise or lower each of the stocks, create jobs and/or attract other related projects. It is up to each team, using the model as a basis for discussion, to decide upon the suitability of the project they have been randomly assigned . After they have made their decision it is modified by the roll of a die; if the result is a 1, 2, 3 or 4 the decision goes in their favour if a 5 or 6 the decision goes against them. As in the real world, in the virtual world of the game projects can only be encouraged or discouraged, whether the projects actually happens becomes a matter of chance.

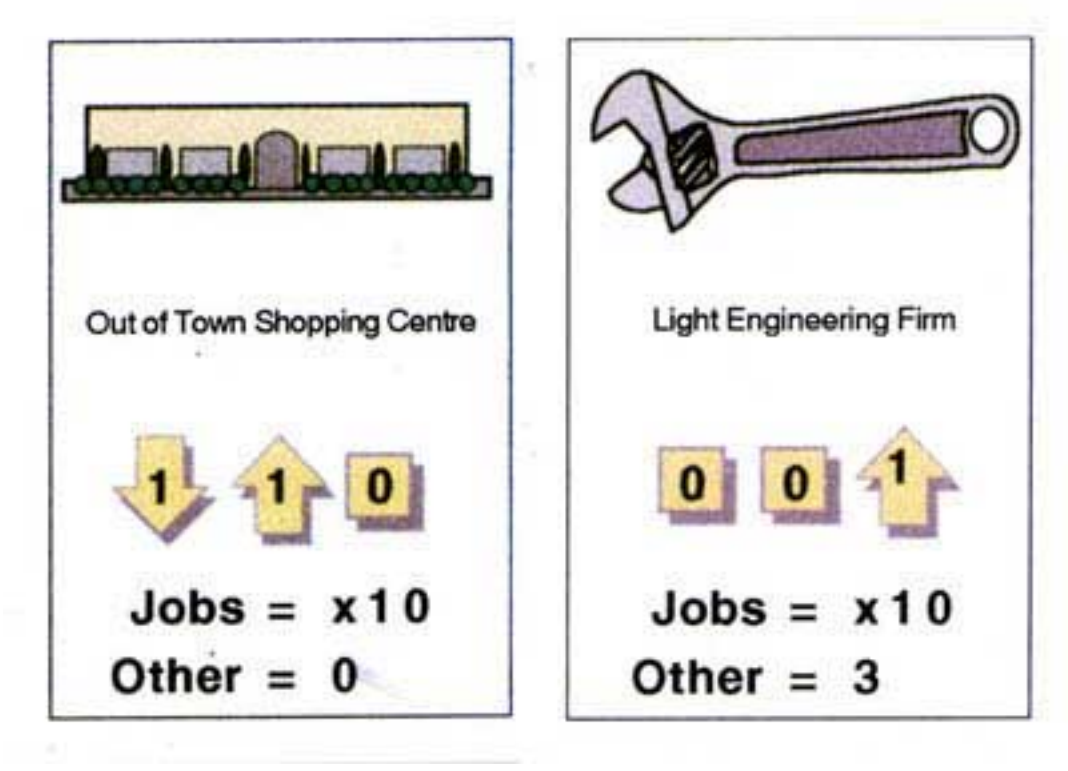

Figure 2. Two sample project cards, showing the movement of the stocks, jobs created and the number of downstream projects attracted.

Figure 3. The Sustain Game being played by delegates at the Great Green Buildings Fair, Leeds (1996).

Some projects *attract* other related projects creating runs of development that may not produce the results players wanted. The players need to respond with a rational planning policy in order to succeed in the game (figure 4). The aim of the game is to achieve the targets set for the area after a set number of game plays.

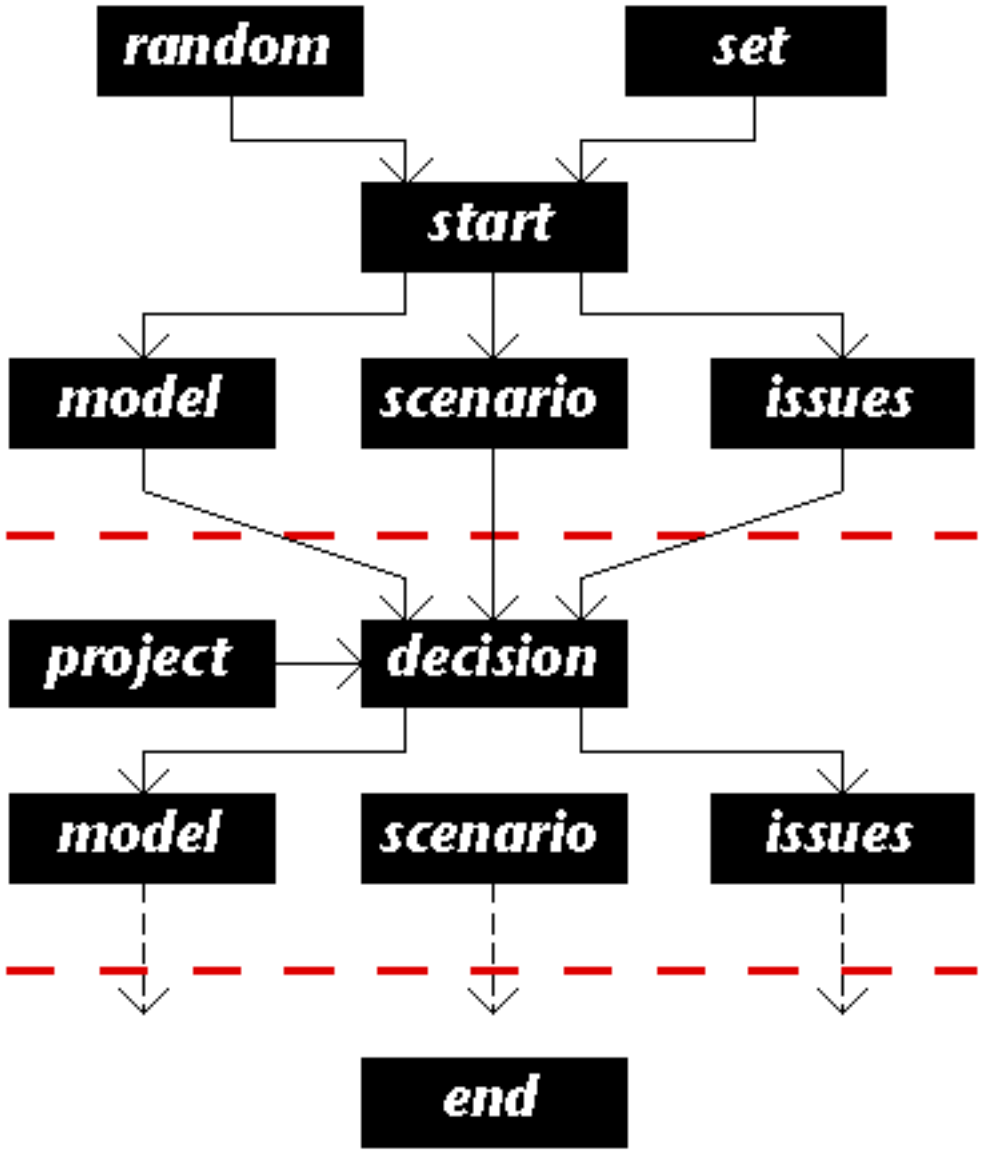

Figure 4. The process of game one.

The second game uses the model to define fictitious scenarios. The scenario settings can be urban or rural, villages or towns. Each group composes a list of attributes relating to their scenario and then indicates the positions of the *stocks* accordingly. The scenarios are then passed to other teams who use the model as a basis for devising policies to improve or protect the level of the stocks. The third game is similar to game two, but it is based upon real situations and is played as a way of

exploring policy options for a real area.

The Children's Eco-city project

> *"Adults should listen to our ideas because they could die in a couple of years." A participant in the Children's Eco-city project, Craigmillar. (T.A.S.C. Agency 1996)*

The children's Eco-city project is a vehicle for showing school children how built projects effect the communities around them. It gives children an opportunity to explore, discuss and debate their living environments, provides an opportunity for children to work with a multi-disciplined team of professionals and allows children a unique opportunity to develop their skills and thoughts of their future city.

To date the project has been run on three occasions. Firstly with a group of children from a number of European countries, secondly with a group of children from a single school in Edinburgh and thirdly with children from a number of primary schools in the Craigmillar area of Edinburgh (figure 5). The third running of the project lasted for four days and was the first to look at a real rather than an imaginary landscape. The task put before the children was to redevelop Craigmillar and what has become known as the 'south east wedge' of Edinburgh, an area where the development process is just beginning.

Figure 5. The Children's Eco-city Project in Craigmillar.

At the start of the project in Craigmillar the children were encouraged to think about

and discuss the good and bad features of their local environments. The children built upon these over the four days and decided what they did and did not want in their city:

> *BAD: Pollution, crime, drugs, graffiti, poverty, rubbish, cars, exhaust fumes.*
>
> *GOOD: Flowers, rubbish recycling, places to play, safety, fewer cars, more people (use empty properties and build new ones), chocolate factories, organic farms, nature parks (to make people happy), forests, adventure playgrounds, a children's council chamber (to influence further development), electrical and wind powered cars.*

By the end of the four days the children had created 'Castlevale', a city of interconnecting villages with a population of 4000. Their city had businesses, housing for all people in the community, emergency services, colleges, leisure facilities, a public transport system which 'goes everywhere' and few roads. At the end of the project it was clear that the participants had learned a lot and had a better understanding of the issues involved in sustainable development.

The computer based application

The initial purpose of our research is to replicate and enhance the model into an interactive computer based application which, while not replacing the paper game, will build upon it and allow individuals to access ideas and information about sustainability. The project started with a framework of five simple proposals concerning the computer based game:

> • *it will be used by individuals to access ideas and information about sustainability.*
>
> • *it should reinforce the model as a device for integrating thinking about the interplay between the three **stocks**.*
>
> • *it should add a level of control and predetermination not possible in the paper game.*
>
> • *it should analyse the game play, comparing the current positions of the **stocks** with their starting points.*
>
> • *it must be cross-platform*

We have now built upon these starting points and produced a prototype computer game using MacroMedia Director.

The Interface

The computer based game follows the same pattern as the paper game. A player can start with the *stocks* in a random position or they can choose to set the *stock* positions as they wish in order to experiment with different scenarios (figure 6). When the starting point is set the computer will put a random project to the user and a decision will have to be made (figure 7).

Figure 6. A screen capture of an early version of the user definable starting screen.

Figure 7. A screen capture of a 'project screen', showing the current position of the stocks and the proposed project.

As described above some of the projects in the paper game attract other related projects. For example, if a group has a car manufacturing plant move into their virtual community a development of private starter homes may be attracted. The players must then make a decision as to whether this new downstream project fits in with their current planning policy, again their decision is modified by the roll of a die, however this time only a 1, 2 or 3 will ensure that the decision is in their favour. Although the link between the opening of a major manufacturing plant and the need for more housing provision is straightforward, in the paper game downstream projects are dealt at random. In the virtual world a tourist viewpoint may be attracted by a sulphuric acid plant and an abattoir by sheltered housing. The computer version of the game exercises some control over such unlikely scenarios by selecting downstream projects from a subset of relevant projects rather than from the whole project set.

Alpha testing environment.

Following the development of the working framework for the computer model it has become clear that the computer game provides an ideal medium for alpha testing modifications to the model. At a simple level the computer simulation has been used to study the implications of adjusting the random factors that control the modifications to players decisions. At a higher level it allows the model to made more realistic in order for us to see whether this reinforces or detracts from the model

itself. If too much realism is added the model can become very complex and teams will fail to consider the three *stocks* only the numbers attached to them. If there is no realism then the model serves no purpose. It is this balance between realism and complexity (Casti, 1997) that the alpha-testing environment of the computer allows us to modify and study.

The paper gaming sessions rely on the game controller to introduce realism randomly into the game, whilst ensuring that the model is still firmly locked in the minds of the players. This is in the form of announcements such as changes in national trends resulting in, for example, all factories manufacturing certain products closing. The computer allows us to experiment with these factors and their effects on the stocks before they are used with community groups.

The computer game also has a level of intelligence ensuring that the random announcements of the paper game are replaced by additional factors that are tailored to the players scenario. This intelligence also enables the computer game to remember the projects a player has previously accepted notifying players of changes in the stocks due to their interaction.

Conclusions

As we have stated above, our belief is not that the computer-based system can replace established techniques, but that it could provide a tool to reinforce the ideas and principles that are central to understanding the problems of sustaibable development. The computer model provides an alpha-testing environment for modifications to the model, which could previously only be tested with a community group in a gaming session, and allows the addition of a degree of intelligence that paper game cannot contain.

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