Behavioural finance and immersive games:
A pan-European framework for design and evaluation

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This paper describes the development of a Design and Evaluation framework that aims to help stakeholders of a inter-disciplinary research project develop a shared understanding of project goals and methods by pooling their knowledge of research approaches and methodologies. The xDelia project (Xcellence in Decision-making through Enhanced Learning in Immersive Applications) www.xdelia.org, is a three-year pan-European project that uses wearable sensors and serious games to investigate how people's behavioural habits and emotional states affect their financial decision making. The project combines research skills and expertise of European partners from different methodological traditions (experimental, economic, field research) who will work together to achieve the project goals. The Design and Evaluation framework will provide a working collaborative model to capitalise on the different approaches, using ongoing participatory evaluation to ensure the development of an integrated set of research questions, optimum use of research instruments and effective collaboration between the different disciplines.

Introduction

The xDelia project aims to produce knowledge and applications that address the effects of emotional regulation in financial decision making in three fields; professional trading, private investment and personal finance. To achieve this aim, experts from seven institutions will spend three years collaborating, pooling their expertise in financial decision making, games design, cognitive science and bio-sensor technologies. One of the crucial factors for the success in any inter-disciplinary project is to harness the potential of the different disciplines and genuinely capitalise on the different approaches and methods brought by partners in the project from their different disciplinary perspectives. To this end a core feature of the x-Delia project is the development of a sound evaluation framework within which research activities can be effectively organised and executed.

Evaluation research since the mid 1980s has identified stakeholder engagement in evaluation and decision making as important contributors to success (Shulh and Cousins, 1997). The approach taken in xDelia is informed by Cousins and Whitmore (1998) three dimensions of collaborative inquiry; *control of decision making*, *selection for participation* and *depth of participation*. To support the evaluation we are developing a design and evaluation framework that will provide the vehicle to ensure that comprehensive, ongoing evaluation is built into all facets of the project and that evaluation findings feed back into the ongoing development activities of the project in a timely manor.

> The challenge of evaluation use epitomizes the more general challenge of knowledge use in our times. Our age – the Age of Information and Communications – has developed the capacity to generate, store, retrieve, transmit, and instantaneously communication information. Our problem is keeping up with, sorting out, absorbing, and using information. Our technological capacity for gathering and computerizing information now far exceeds our human ability to process and make sense out of it all. We're constantly faced with deciding what's worth knowing versus what to ignore. (Patton, 1993 pp5-6)

Method

An important early task in the development of the framework is to ensure that consensus is achieved between project partners on all aspects of the research process, including research questions, methods and evaluation. This consensus building and iterative refinement is one of the first joint activities undertaken as part of the framework but will remain as an ongoing process throughout the project lifespan. Participatory design offers a means to achieve this consensus by involving project partners in each stage of the design of the evaluation framework. Participatory design has been in use since the 1970s (Namioka & Shuler, 1993) and is based on the premise that end users need to be actively engaged in the design process to ensure that it meets their needs. In the context of an inter-disciplinary research project, this translates into active involvement and collaboration in the development of research questions, research methodologies and methods used to answer those questions.

To achieve consensus, we shall track the aims and perceptions of the different project partners. Initial data were collected in month 3 of the project through a set of baseline interviews in which partners were asked a series of questions about their goals and aspirations for the project, and about what they saw as the strengths and challenges. These interviews have been analysed using qualitative techniques to identify common themes, convergences and divergences of ideas, highlighting potential problems. This methodology is supported by use of an evaluator reflective journal (Poth and Shula 2008).

The Design and Evaluation Framework will play an important role in facilitating the development of this shared understanding and consensus within the group, both of the goals of the project and of the methods used to achieve those goals. Because of the distributed nature of the project, the framework uses a range of collaborative technologies to facilitate knowledge creation and sharing between partners including a shared project-wide wiki, a social networking site for learning and teaching, Cloudworks (Conole and Culver, in press) and Flashmeeting, a means to record multi-way video conversations across the internet (KMI, The Open University, 2009). In addition, wearable sensor technologies, serious games and a simulated trading platform are among the resources available to support the research interventions.

A key focus of the evaluation framework is the establishment of the overarching research questions that guide the project design, development and implementation activities, and the reconciliation of these research questions with the range of methods practiced by the project stakeholders. To address these overlapping foci, project stakeholder workshops are held to which all partners are invited to participate. The aims of each workshop vary, however they share an overarching aim of moving project partners toward a shared understanding of the goals and key elements of the xDelia project and the evaluation findings contribute to the evolving Design and Evaluation framework. There are three types of workshops: i) prototype development workshops, ii) substantive, subject-orientated workshops, and iii) design and evaluation workshops. The framework will be tested against each type of workshop and evolved, based on the findings.

This paper describes how the framework was applied to a prototype development workshop; the Games Design workshop. The Games Design workshop was held in order to evaluate what forms of games might be developed for the project, what concepts might be investigated and to identify the key questions relating to improving financial capability amongst individuals.

The design and evaluation framework

The Design and Evaluation framework is in the early stages of development. It has been based on a participatory and iterative approach, which aims to be 'useful' rather than rarified – i.e. formative evaluation that feeds into and informs project activities as they occur throughout the project on an ongoing basis, rather than a more removed summative evaluation which merely reports on project activities towards the end of the project lifecycle. In addition to drawing out specific instances that occur across the project, we want to explore a number of underlying themes, some of which arose from the baseline interviews. For example, the way in which complex inter-disciplinary projects of this kind are coordinated can have a significant impact on how well the project works and the extent to which overarching objectives are achieved. Similarly we want to examine what kind of collaborative activities occurs in the project and the extent to which they are successful or not. Finally what critical moments occur and how do they steer subsequent project work? In keeping with the notion of being participatory, iterative and 'useful' the Design and Evaluation framework encourages partners to adopt a critically reflective approach to the evaluation across the project – everyone is asked to reflect on what they are doing; everyone is a researcher/reflector/evaluator.

Figure 1 shows how the Framework is split into a Design layer and an Evaluation layer with each building upon and feeding into the other. The Design layer represents the research questions, interventions and analysis from the perspective of the research activity. The Evaluation layer represents these same aspects from the evaluative perspective. Both Research and Evaluation activities formulate their research question in the left most box. The intervention is then designed and implemented in the centre box. Data is collected and analysed and the analysis then feeds back into future interventions and, if necessary, research questions. The remainder of this paper illustrates how this framework was first used by applying it to the Games Design workshop. Data collection and comparative analysis of the three workshop types is not yet complete and so is not included.
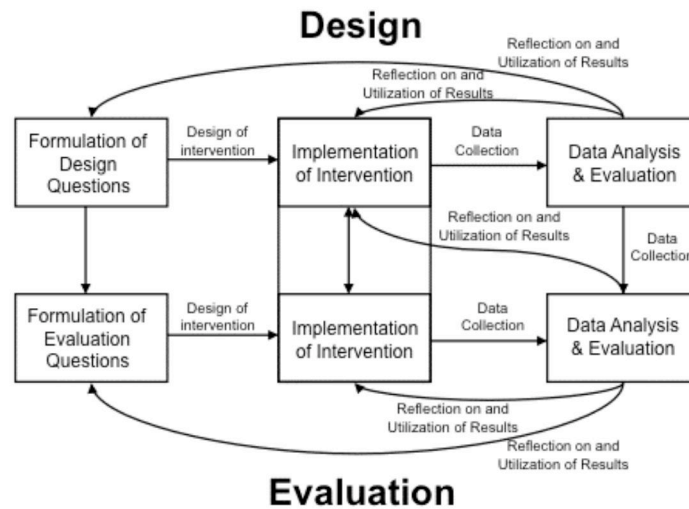

Figure 1: Design and evaluation framework

Applying the framework: The games design workshop

The Games Design workshop was held in month three of the project. The partners hosting it are responsible for creating the serious games that will look at how emotions affected financial decision-making amongst members of the public. This involved two main project work packages; WP3, Financial Capability (FinCap) and WP4, Games Design. The partners with experience in financial capability had no experience in games design, and the games designers had no experience in the issues of financial decision making by private individuals and the other attending partners had no experience in either financial capability or games design. Figure 2 gives a graphical representation of the Design and Evaluation Framework applied to the Games Design workshop.

The research questions for the Games Designers enquired what were the key questions that needed to be addressed by serious games aimed at improving individual financial capability and asked which of the games and concepts that emerged as a result of the workshop might be worth developing further. Additional workshop aims included helping non-games design partners gain a better understanding of the process of designing games, to explore evaluation criteria for games aimed at improving financial capability and to document an initial set of games prototypes. The Evaluation questions asked which aspects of the workshop structure worked well, and which aspects worked less well. In addition, the Evaluation aimed to abstract examples of good practice demonstrated during the workshop and make these available to other teams for future workshop activities, to feed into the overarching evaluation research questions, teasing out issues of inter-disciplinarity and to synthesize and feedback a critical evaluation of the event.

The design interventions

The workshop began with a briefing on financial capability to give all partners a basic understanding of the principles that needed to be addressed by the games they developed. Partners were then split into groups of four or five. Each group had one games designer who acted as facilitator. The other partners brought expertise in individual financial capability, banking, investing and trading practices, educational technology, cognitive psychology and the role of emotion in financial decision making. Each group was given an online brainstorming tool, which presented them with four brainstorming methods with which to
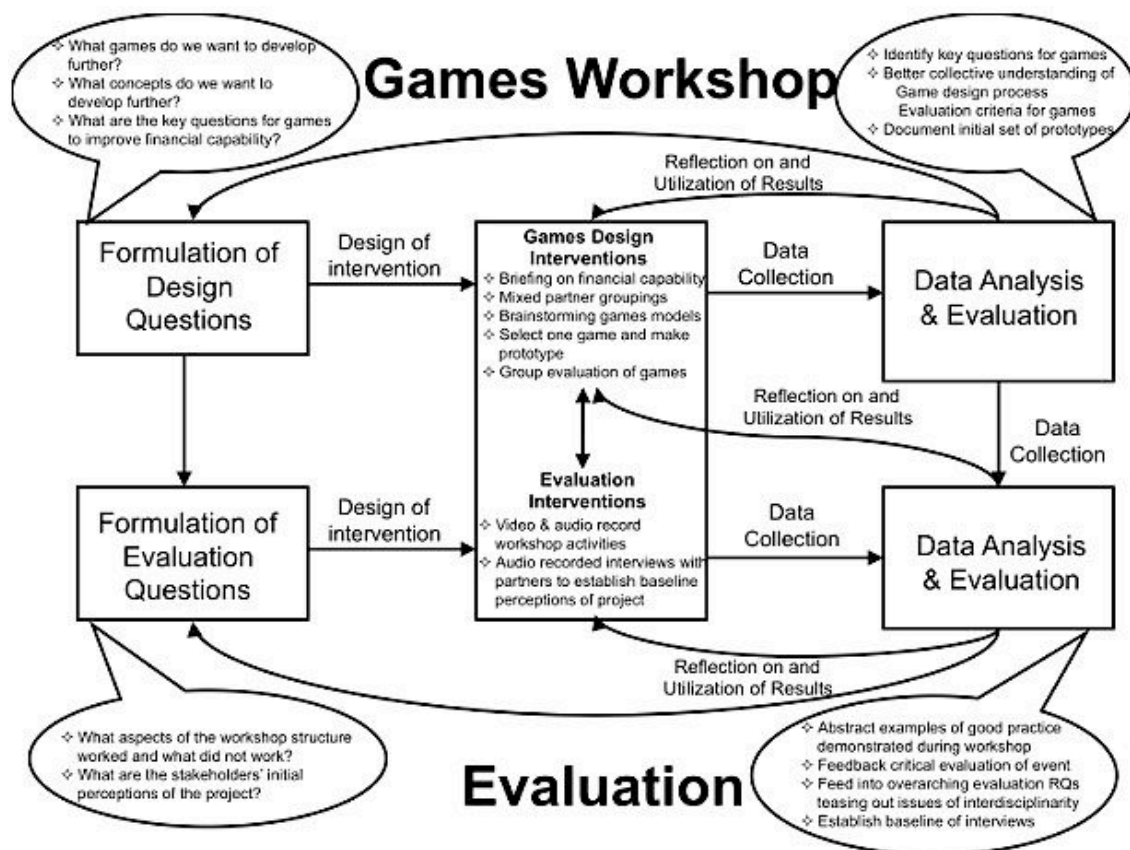
Figure 2: Games design workshop evaluation

trigger ideas for prototypes. One game idea was then selected for prototyping and each team then designed and built their game. The teams then merged and tried out and evaluated each game prototype during a group session at the end of the workshop. The games designers analysed the data they collected from the workshop to contribute to the project task of designing games that would address financial capability.

The evaluation interventions

The workshop activities were video and audio recorded and analysed to identify examples of good practice to inform the design of future workshops. Partners from each of the different project disciplines were interviewed to establish their baseline expectations of the project. Partners who were not present during the workshop were interviewed remotely via Flashmeeting. This data was collated and made available to all project members via the shared wiki.

Discussion

The data analysis outputs are fed back into the project, refining the research questions for both the Games Designers and the Project Evaluation team via the *reflection on and utilization of results* links as well as supporting the design of future interventions for both the Design and Evaluation layers These links represent feedback over time that result in new questions and new interventions that are informed by earlier experiences. The connections are instantiated through the project wiki which provides a virtual locus through which partners share and collaborate on the project outputs, ensuring lines of communication and shared engagement of all partners with all aspects of the project.

Building on the evaluation of the Games Design Workshop, a Design and Evaluation workshop was run, incorporating practices that had worked well, such as breaking out into smaller groups to focus on ideas that would then be fed back during a whole-group evaluation session. A substantive subject-oriented workshop is planned for the coming months.

At the time of writing, the three-year project is approaching the end of month six. The Design and Evaluation framework is in place and the findings are being fed back in to inform the design of project

activities to ensure that the project works as a coherent whole, rather than as a disparate set of participating institutions. We have argued in this paper that the framework provides a valuable structure to help foreground and make explicit different project activities and the impact they have on how well the project is working towards achieving its objectives. It helps articulate the design and evaluation aspects of the project and how these are inter-related. Partners learn with and from each other and use a range of collaborative technologies to support a growing knowledge-base to act as a project-wide resource.

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