

Using Participatory Evaluation to Support Collaboration in an Interdisciplinary Context

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Abstract

Many research projects involve teams of researchers working together to create shared outputs that advance the state-of-the-art knowledge in a particular field. Often, such teams are distributed geographically, with members drawn from different institutions and different domains of expertise. In an increasingly networked world, researchers are presented with a variety of ways to connect with each other, and it is often assumed that because it is easy to link-up together, that effective collaboration will follow. This is not always the case. Just because we have access to collaborative technologies does not mean that we will necessarily use them, or that if we do use them, that we will be able to do so effectively.

This is a particularly important issue for pan-European projects who assemble partners not only from different institutions, but also from different, and sometimes conflicting methodological traditions. Bringing together research partners from diverse research domains presents both opportunities and challenges. Partners need to learn from each other so that they can collectively produce a finished product that uses their combined knowledge to push the research boundaries. However it can be difficult to work together across disciplines, to develop a shared vocabulary and understanding, and to overcome the barriers of distance and language in order to collaborate effectively.

This paper describes how the challenges of interdisciplinarity and distance are being addressed on an EU funded project, xDelia. xDelia stands for Xcellence in Decision-making through Enhanced Learning in Immersive Applications. It aims to use wearable sensors and serious games to identify and address the effects of emotional regulation in financial decision making in three fields; professional trading, private investment and personal finance. Over a period of three years, partners from seven institutions will work together, sharing their expertise in financial decision making, games design, cognitive science and bio-sensor technologies. In order to collaborate effectively, partners need to achieve a shared understanding of their common goals and of what each research team can contribute. This paper describes the practical, participatory approach adopted by the xDelia team, demonstrating how the collaborative knowledge sharing activities initiated at the start of the project have resulted in a range of collaborations, and analysing the role that mediating artefacts such as collaborative technologies have played in supporting this knowledge creation.

Keywords

Evaluation, collaboration, social technology, interdisciplinarity, technology mediation

Introduction

The xDelia project is a European-funded three-year project that aims to use a combination of bio-sensors and serious games to identify and address the effect of emotional regulation on financial decision-making. It focuses on three distinct groups of financial-decision makers; traders, investors and private individuals. The project is built on a complex and distributed work-based network that involves bringing together knowledge and expertise in different disciplines from institutions based all around Europe. To achieve the project goals, each disciplinary team needs to cross the boundaries between its own practice and those of partner institutions. A team of experts in finance are looking into the activities of traders and investors, and experts in personal financial capability are driving research into using serious games to address the effects of emotional biases on individuals as they make financial decisions in their daily lives. Working with these teams are researchers in the field of serious games who understand how to design and programme games, researchers in sensor technology, who have experience in

looking at the role of sensors, particularly in supporting medical applications, and cognitive neuro-scientists who have access to a wide range of lab-based sensor equipment and behavioural studies.

There is overlap of expertise between some of the teams which aids the development of a common understanding. The cognitive scientists specialise in neuro-economics which provides shared understanding with the experts in the field of business finance. The bio-sensor team and the neuro-scientists share an insight into the different types of bio-feedback that can be used effectively to research emotional responses. However there are other areas where there is no shared understanding and where each of the specialist teams needs to learn from the other. For example, the games designers need to understand what types of financial decision-making processes that the games need to simulate for both trading and investment, and personal financial capability. What are the characteristics of a financially capable individual? What are the typical stressful decisions that a trader or investor makes and what is the context that surrounds them? The games team also need to understand what sort of feedback they can expect to get from the sensor data. Likewise, the financial experts need a basic understanding of the processes involved in designing games in order to provide the games designers with the sorts of information that will enable them to design useful games. They also need to understand what types of sensor readings can be collected and how they are collected and analysed, and the types of data this analysis will produce. For example, there is no point in using a finger clip to collect electrocardiogram (ECG) readings from somebody who needs to use all their fingers to type. Learning that crosses practice boundaries in this way presents a range of both domain-related and cultural challenges, for example a lack of shared discourse (Thorpe, Conole, & Edmunds, 2008) may inhibit collaboration, the use of English as the main language may give rise to misunderstandings when partners from two or more nationalities are communicating in a language that is not native to any of the speakers.

Additional challenges arise from the geographical distribution of the teams across several European countries. This creates a complex and interdisciplinary network of individuals collaborating to achieve a shared goal. The network is bounded, including only those partners in the project, and effective collaboration requires that partners share their knowledge and expertise with each other. Thus partners have a dual role as both teacher and learner. In this context, the “teacher” role is about guiding and supporting others so that they understand enough about unfamiliar disciplines to create useful study interventions that build on the different expertises and research tools available. The “learner” role is about developing a shared understanding in order to collaborate effectively.

To address the challenges inherent in collaborating across such a diverse network, a design and evaluation team forms an integral part of the xDelia project. Unlike traditional summative evaluations that take place at the end of the project, the xDelia project has adopted a participatory, formative approach to facilitate the development of a shared understanding, deploying a range of technologies to support collaboration. To this end, a Design and Evaluation (D&E) framework (Clough et. al., 2009) has been developed. The D&E framework fulfils a dual function. On the one hand, it acts as a model for the design of effective project interventions, providing structure and support for good practice. On the other, it acts as a lens through which to reflect on what happened during the intervention, involving the stakeholders as reflective evaluators and feeding the findings back into the project on an ongoing basis. Project interventions take the following forms:

1. Study Interventions: These are research activities that aim to provide data for the research. For example, a pilot study that uses bio-sensors to identify which physical responses are linked to known emotional responses triggered by particular stimuli.
2. Workshop Interventions: Involving all partners, workshops are hosted by the different partner institutions, and each workshop has a different goal although all share the overarching aim to further the development of a shared understanding between project partners.

Both forms include an evaluation element. In addition, dedicated evaluation workshops are run in order to progress the overarching evaluation questions posed at the start of the project and revisited periodically.

This paper will focus on a Workshop intervention held to further the development of a shared understanding between project partners, using the D&E framework to highlight the role of mediating artefacts in the collaborative process and measure the outcomes against the goals. Three types of workshop have been undertaken: i) prototype development workshops, ii) substantive, subject-orientated workshops and iii) design and evaluation workshops. The workshop discussed in this paper is the Games Design workshop (type i).

Theoretical Underpinnings

During the 1980s, stakeholder participation and engagement in evaluation and decision making was identified as important contributors to the success of evaluation (Shulha and Cousins, 1997). By the 1990s, the nature and extent of stakeholder participation was characterised by Cousins and Whitmore (1998) into two streams of participatory evaluation; Practical Participatory Evaluation (P-PE) and Transformative Participatory Evaluation (T-PE). P-PE approach encourages stakeholders to participate in all evaluation phases by promoting knowledge sharing and collaboration in the decision-making process:

The core premise of P-PE is that stakeholder participation in evaluation will enhance evaluation relevance, ownership, and thus utilization. (Cousins and Whitmore, 1998)

The evaluation approach taken in xDelia matches the P-PE stream and is informed by the three dimensions of collaborative inquiry identified by Cousins and Whitmore; *control of decision making*, *selection for participation* and *depth of participation* (Cousins and Whitmore, 1998). Figure 1 (reproduced from Cousins and Whitmore, 1998) illustrates these dimensions graphically.

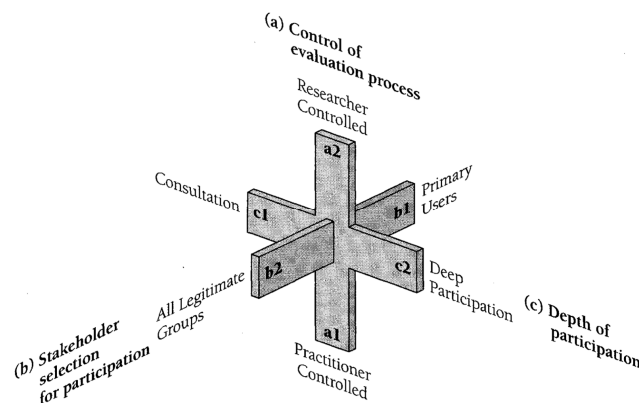


Figure 1 - Three dimensions of collaborative inquiry

This representation allows us to locate the evaluative processes in the three dimensional space of the figure and is applied later in this paper to the Games Design Workshop.

The Design & Evaluation Framework

From the start, the xDelia project adopted a participatory approach based on facilitating stakeholder engagement. In xDelia, the stakeholders are the project partners. It is important that all partners engage with the both the collaborative and evaluation processes (Oliver et al., 2007, Poth and Shulha, 2008), sharing their expertise and learning with and from each other in order that the overarching goals of the project can be achieved within the set timeframe.

To speed up the process of knowledge-sharing, a series of workshops were held in the first 9 months of the xDelia project. Initially, these were held face-to-face to enable partners to get to know each other and to provide opportunities for informal networking and knowledge sharing over lunch and coffee breaks. However, subsequent interventions were conducted remotely using collaborative synchronous tools such as Flashmeeting (KMI, The Open University, 2009), Adobe Connect and Skype. Partners also use asynchronous tools to support and coordinate collaborations. A project wiki provides a communication and knowledge sharing space where partners distribute links to relevant literature, conduct asynchronous discussions, post progress reports and coordinate group meetings and project interventions. A secure repository is hosted at one of the partner institutions where documents created for the project may be stored and linked-to from the wiki. A range of other artefacts and technologies are used as determined by the needs of the project at the time, for example Twitter, Cloudworks (Conole & Culver, 2009) and a computer-based brainstorming application.

The D&E framework was designed to facilitate the evaluation of these collaborations. This framework clarifies the interdependent relationship between the research questions, research interventions, the evaluation, and the mechanisms by which the findings from the evaluation are fed back into the project to inform future interventions. Figure 2 illustrates the framework as it was applied during the analysis in this paper, highlighting the interdependent relationship between the design and evaluation sides of the framework in which each builds upon and feeds into the other.

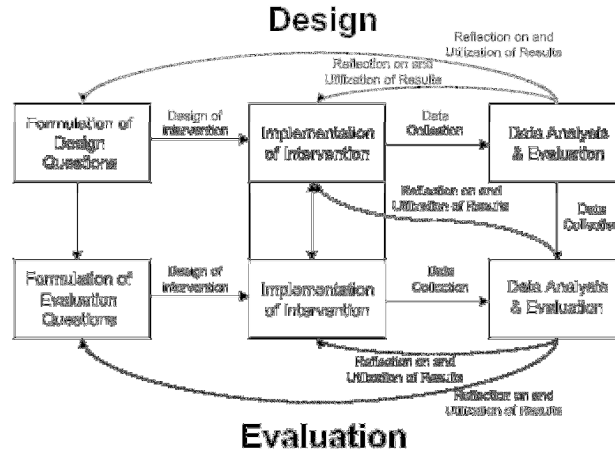


Figure 2 - Design and Evaluation Framework

The D&E Framework consists of two layers – a Design layer and an Evaluation layer. The design layer represents the research questions, interventions and analysis from the perspective of the research activity, for example, a workshop to brainstorm methods preliminary research interventions. The evaluation layer represents these same aspects from the evaluative perspective. An evaluation layer intervention might include video of the workshop activities, interviews with the participations, pre and post questionnaires and debriefing sessions. Both design and evaluation activities formulate their research questions in the left most box, with the evaluation RQs guided, to some extent, by those of the design layer. The intervention is then implemented in the centre box. Data is collected and analysed and the analysis then feeds back into the interventions and research questions.

The D&E Framework represents an iterative process, in which the evaluation findings feed back into the project over time. Figure 3 extends the D&E framework over time, showing how the analysis from earlier interventions feeds into future interventions.

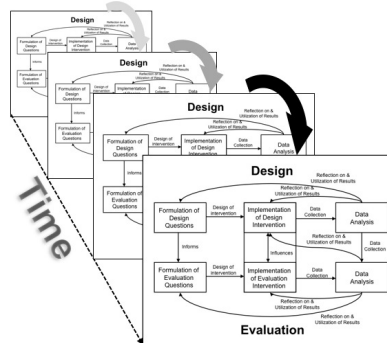


Figure 3 - Design and Evaluation Framework over Time

The outcomes from the Evaluation layer relate to the specific evaluation research questions asked at the time. For example, Evaluation RQ1 asked “What are the different partners’ perceptions of xDelia and how well are these met?”. However, additional Evaluation layer questions are included that derive from the Design layer questions and interventions, for example an evaluation of the effectiveness of the intervention and the impact of technology, and these too feed into the design of future evaluations.

Applying the D&E Framework to the Games Design Workshop

This paper applies D&E Framework to the Games Design Workshop, hosted by the games designers in Sweden. This was a table-top game prototype development workshop that took place in month three attended by representatives from each of the different disciplines. The goal of the workshop was to facilitate a shared understanding between the partners of the role that serious games could play in addressing problems of individual financial capability by asking the questions: RQ1: What form of games do we want to develop further? RQ2: What concepts do we want to develop further? and RQ3: What are the key questions in developing games to improve individual financial capability?

To be able to answer these questions, the Games Designers needed to acquire an understanding of the types of financial problems their games would have to address, thus situating them in the role of learner. However the flow of information needed to achieve the goals of the workshop was two-way. The other partners also needed to understand the types of learning situation that could be effectively created through the use of serious games. They therefore needed to learn about the processes involved in designing games so that they could better appreciate the role that games might play in their studies. Thus all attending partners acted as both learners and teachers.

The workshop ran over two days and began with an introduction to the workshop. This was followed by two presentations about the financial issues that needed to be addressed. These were “expert led” sessions, with the presenter talking through a series of concepts to the audience. However the setup was informal and participants engaged with the presenters to clarify and enlarge upon the financial issues being described.

Next, participants split into interdisciplinary groups. Each group had two hours to brainstorm ideas for games that would address the issues of financial capability outlined during the first presentation. A computer-based brainstorming tool was provided to help trigger ideas and the activity was framed by instructions such as “Must be capable of being learned in 10 minutes” and “For 2 to 4 players”. The groups then selected their best idea and put together a playable prototype. Groups were provided with a range of non-technological artefacts such as die, paper, post its, felt-tip pens, scissors, glue, tokens. The domain expertises were spread as evenly as possible between the groups, with one games design student in each group to facilitate the brainstorming and prototyping process. Each group had at least one person with expertise in either business or individual financial capability.

Having constructed three copies of the playable prototype, the participants came together as a whole group to evaluate each game in turn. To this end, two participants played each game and the rest watched and took notes. Different participants played each game so everybody got the opportunity to evaluate. After playing the game prototypes, participants gathered together as a whole group to complete individual game evaluation forms and discuss the evaluation. The results were collated after the workshop on the wiki.

The Evaluation RQs and interventions were designed to assess the effectiveness of the workshop. In addition, baseline interviews were conducted as part of the Evaluation work in order to identify a set of themes that could be interrogated, later on in the project, to answer the Evaluation RQ1: What are the different partners’ perceptions of xDelia and how well are these met? The workshop interventions were audio and video recorded.

Cooperative Inquiry

Assessing the Games design workshop against Cousins and Whitmore’s (1998) three dimensions shown in Figure 1 situated it as A1, B2, C2, which Cousins and Whitmore classify as “Cooperative Inquiry”. The control of evaluation process (dimension A) falls close to the A1 end. Workshop participants had an input to the content and structure of the workshop both in advance (through the wiki) and during the event (through the interactive game design and evaluation tasks). During the workshop, evaluation was first conducted as a group, with each game being played by two participants under the gaze of the rest of the group. Participants gave feedback and scored the games using individual forms followed by a whole group evaluation session where each game was discussed and the evaluation captured on a whiteboard and then shared via the wiki.

Stakeholder selection for participation (dimension B) was at B2 because the workshop was open to all partners (all legitimate groups), not just the Games Designers and the Financial Capability experts (primary users). This

is important because it would be easy for such a distributed and inter-disciplinary project to fracture into small sub-groups, with each group working on its own part of the project and losing a view of the coherent whole.

Depth of participation (dimension C) fell close to C2, deep participation, because the workshop content was constructed out of the different competencies of its participants, rather than provided by the organisers. The workshop merely provided the space within which the participants collaborated to create games ideas and evaluate them. The workshop outputs were collated after the event and shared through the wiki.

Findings

Figure 4 shows how the D&E framework provided a structure for the project interventions; linking the RQs to appropriate interventions, data collection, analysis and outcomes. The analysis and artefacts used in the workshop are all preserved in the project wiki. However it is the D&E Framework's role as a reflective lens in which all stakeholders actively participate in the evaluative process that we explore further in this paper.

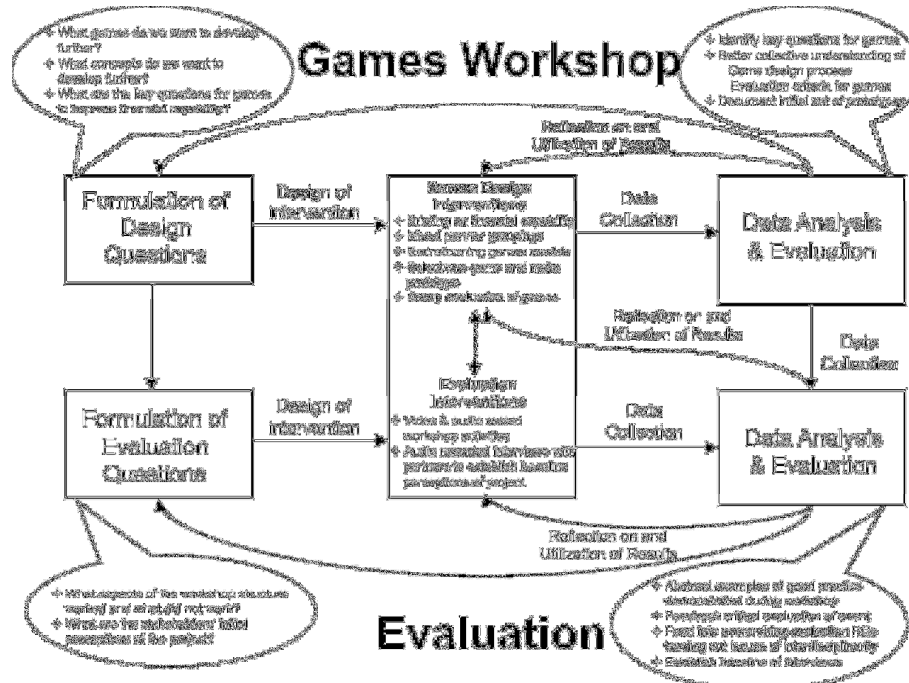


Figure 4 - Games Design Workshop Analysis Detail

Mediating Artefacts and the Role of Technology

One of the things we are interested in looking at through the D&E framework is the way in which technology mediates interactions across the project, and how the affordances of different technologies influence that mediation. Previous research identified an important mediating role for technological artefacts in guiding and framing a participatory design workshop (Scanlon et al., 2009). However the initial evaluation research questions for the Games Workshop did not include a question about technology mediation because technology use was not foregrounded in the planning discussions. Subsequent analysis of the video and audio data identified an important role played by mediating artefacts and this fed back into the Evaluation Questions via the "Reflection on and Utilisation of Results" link. Detailed over-the-shoulder data was available in the form of the video recordings to support this analysis.

Prior to the workshop, we were already seeing some interesting evidence about how technology can be used to support interdisciplinary collaboration. For example, Flashmeeting discussions are all recorded and accessible via a unique Uniform Resource Locator (URL). Therefore, links to the different Flashmeeting recordings can be posted to the wiki alongside with notes from the meeting enabling all project partners to listen to the original

discussion as well as reading the summary. Tensions have emerged around open technologies such as Twitter or Cloudworks and whether their use might lead to intellectual property issues relating to premature release of project findings. However the closed project wiki is not without issues. As it grows in size with the accumulated contributions of the partners, it becomes increasingly complex and locating information becomes more difficult.

Nevertheless, the wiki remains the central virtual location for collaboration and for project outputs. The Games Design workshop was coordinated and organised using the wiki. The wiki records of these dialogues show emerging patterns of team member interactions, illustrating how they are stating their positions and jointly co-constructing their understandings of the planned activity. For example, the following quote represents a wiki dialogue between a finance domain expert planning to attend the workshop, and a Games Design expert:

- Q1) Are we (xdelia colleagues) going to be joining in with the design process or observing it?
A1) You will be joining in with the design process. There is no point just to be observers.
Q2) you mention that the games will be played by 2-3 players. I had envisioned a final product that could be played alone. Is the multiple player option just one part of the process or is it a different kind of solution? *Financial Domain Expert*10:44, 6 May 2009
A2) It can be envisaged as a single player computer game, but then the prototype needs someone to play the part of the computer. Hence it becomes a 2 player prototype.

In this extract, the finance expert uses the wiki to develop her understanding and position in relation to the workshop, articulating her thinking and what she is looking for. The wiki provided a good run-up space (for those who were comfortable in it) for partners to prepare and develop a shared understanding of what the workshop was about. For example, the financial domain expert posted examples of the sorts of financial challenges students might be faced with. This led to a dialogue which included links out to related literature, thereby enriching the resources available for the workshop and providing a mechanism to help participants from the other partner domains to start thinking in terms of what the games needed to address.

Task Framing

The collaborative interventions conducted during the workshop were framed by paper instructions and guided by each group's facilitator. Four different brainstorming methods were to be used, 30 minutes on each method. At the end, one idea was to be selected and developed into the prototype. However the activity tended to overrun the time allocated. Group members needed time to read, discuss and agree on how to apply the task guidelines, for example Group 1 spent some time discussing how the first brainstorming technique would work:

- Participant1*: "That noun, verb, and adjective should go with the instructions that we've just been talking about, because we know already that..."
Participant2: "That this is where our focus lies"
Participant1: "Yes, so the presenter just gave us some focus,
Facilitator: "Yes, that's fine"

By the time they had come up with an idea for a game, Group 1 had spent 50 minutes on the first brainstorming technique. Brainstorming method 2 involved a computer application that displayed visual images and keywords designed to trigger creative ideas. Again, it took time for the group members to understand what was expected of them and how the application worked. They spent over an hour on this task. At the end of these two brainstorming activities, Group 1 had come up with two game ideas and they decided to combine the best elements of both to produce their prototype rather than overrun the time allocated for brainstorming.

Post Workshop Reflection and Feedback

After the event, a short feedback questionnaire was circulated. The financial experts who responded felt they had learned something about designing games and the games designers who responded felt they had learned something about financial capability. They were also asked to name three things they liked and three things they disliked about the workshop. Things they liked include: "Opportunity to work as a team", "Seeing how we can work together and what we can expect from the project", "Some fascinating outputs", "Developing ideas about games". There was agreement about the dislikes; "Amateur brainstorming facilitation", "Too many methods of brainstorming", "A little time pressured" and "Little opportunity to talk with people not on my team". These

reflections were confirmed by the video data and reinforced the need to allow sufficient time for people to understand task instructions, and to get to grips with new technology. These reflections and analysis of the video and audio data fed into the planning for the next workshop where more time was allocated for different activities, and clearly defined breaks for coffee and networking were built into the. The workshop findings and evaluation session outcomes were made available to the project via the wiki.

Conclusion

The practical participatory approach adopted by the xDelia team has resulted in increasing participant engagement in the evaluation process. For example, the evaluation team cannot always attend project interventions in person, therefore the other partners are actively joining in the evaluation process by collecting evaluation data (such as video and stills images) required to answer evaluation layer research questions. This engagement has created networked learning opportunities in which participants share their expertise with each other and collaborate across disciplines.

Because of the way in which the D&E framework articulates the relationships between the research areas, foregrounding the research questions, methods and interventions, we are starting to see patterns of team member interactions emerging from the data. At the project kickoff meeting, the Design and Evaluation team discussed a range of collaborative technologies that could be used in the project. Subsequently, partners have made effective use of these both to support their interactions and to create a record that can be shared with other team members. For example, summaries and links to recordings of meetings are shared via the wiki.

As the project interventions unfold, the D&E framework highlights tensions and areas where further interventions are required. Collaborative technologies play a complex role in mediating these interventions. Often it is difficult to schedule face-to-face interventions due to time constraints and cost, therefore partners have selected appropriate collaborative technologies (Flashmeeting, Adobe connect) to support a series of virtual interventions. Mixed-mode interventions are also organised in which partners who are unable to attend in person are participating via video link. Thus the collaborative technologies are enabling partners to work together flexibly, sharing not only their domain-specific knowledge with each other, but also their experiences of the collaborative process as recorded in the persistent digital records they create. This use of technology to share knowledge and ensure that the processes are transparent to all partners is proving to be a key element in creating conditions in which effective networked learning can take place.

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