

# ***Problematizing Participatory Research for Developing Semantic Web Technologies***

## **Abstract**

This paper problematizes the concept of participation in the design and development of semantic web technologies by highlighting the uncertainties and contingencies inherent in adopting a participatory approach. Rather than viewing uncertainty and contingency as devaluing research, the case is made that this can allow for enrichment of the development process and subsequently the research outcomes. Participatory approaches to the design of emergent technologies allow for reflection, adaptation and flexible action relating to pedagogy and practices as well as technology. As the basis of this problematisation of research practice, empirical data was analysed from field research for an interdisciplinary, multi-institutional technology enhanced learning (TEL) research project. The research project explored the potential of semantic web technologies in Higher Education (HE) to support the use of cases in teaching and learning. This project took place in six academic settings across different institutions. Data was collected throughout the project including researcher's wiki-based reflective research logs, transcripts from project meetings and interviews and focus groups with participants and observation notes. Analysis of this data was supported with ideas from Actor Network Theory, which allow the recognition of nondeterministic constructs and acknowledgement of fluidity and contingency in research practice. Using these ideas it was possible to reconsider who or what was participating in our research and also when in time and where in space that participation took place. The findings highlight the uncertain and contingent nature of (1) the settings where design took place; (2) who and what was enrolled to participate; (3) acceptance or rejection of research methods; and (4) the groups that emerged as interested parties in our work. These contingencies are related to the pragmatics of research, non-human actors, culture and structure of the research settings; and the complex identity of 'Users'. Vignettes from two different research settings are used to show how participation was enacted, adaptations were made and different versions of semantic web technologies were developed. Through the process of participatory research for this project new teaching practices were developed, pedagogical reflection was inspired and new technologies were developed.

## **Keywords**

Participation; technology enhanced learning; interdisciplinarity; higher education; semantic web technology

## **Introduction**

The concept of participation is widely invoked in applied research as is evident in the literature across disciplines - social sciences, education and technology design (e.g. Noffke and Somekh, 2009; Billies et al., 2010; Olsson 2004; Könings, Brand-Gruwel & Merriënboer, 2010). However, the way in which participation is interpreted and enacted as part of research practice is rarely examined using empirical data. Equally the process of research and development of emergent technologies such as semantic web tools deserves to be considered as encompassing distinct processes and outcomes to the implementation of more stable digital technologies. This paper was inspired by the author's experiences of uncertainty and contingency associated with participatory research on a multi-institutional, interdisciplinary, Technology Enhanced Learning (TEL) project called Ensemble (2008-2011). The project brought together researchers with divergent backgrounds and ontological and methodological assumptions, which were found to influence different aspects of the enactment of research (Rimpiläinen, 2013). A key element of this divergence related to understandings of participation between researchers and participants associated with the project. Therefore there was a need to problematise this concept in order to create a space for reflection on the values, assumptions and commitments that we hold as researchers and how that translates to practice (Carmichael and Jordan, 2012).

In this paper, participatory constructs are compared with an analysis of the working relations of participation that took place through Ensemble TEL research. This comparison is supported with ideas from Actor-Network Theory (Law, 2007), which allowed the examination of empirical data collected during the Ensemble project and acknowledgement of the fluid and contingent nature of our participatory practices. It was found that enactments of participatory research varied in relation to where participation takes place, who or what facilitates participation, the selection or creation of methods and expectations for group dynamics and community creation. The uncertainties and contingencies relating to each of these constructs are demonstrated in a description of research practice taking place in two different research settings. Through this analysis it is shown that uncertainty and contingency enabled flexibility and adaptation within practice that enriched the outcomes of the research.

The Ensemble project was funded under the joint Economic and Social Research Council (ESRC) and Engineering and Physical Sciences Research Council (EPSRC) Technology Enhanced Learning Phase of the Teaching and Learning Research Programme (Pollard 2007). The project involved researchers from the Universities of Cambridge, East Anglia, Essex, Stirling, City University, London and Liverpool John Moores University. This included one PI, seven co-investigators and two research associates. Teaching staff and students also took major roles in researching pedagogy and technology development in their own disciplinary fields alongside the wider research team.

Ensemble explored the potential of semantic web technologies in Higher Education (HE) to support the use of cases in teaching and learning. Therefore the focus for technological development for the project related to the semantic web, which is dependant on common formats being used with online data, allowing integration and combination across applications, to reveal relationships between pieces of data (World Wide Web Consortium, 2010). But the take up of this grand vision has been patchy and development activity has been disconnected (Carmichael and Jordan, 2012). The Ensemble project chose to investigate and develop semantic web technologies through the use of SIMILE open source tools initially developed by the Massachusetts Institute of Technology (MIT) Libraries and MIT Computer Science and Artificial Intelligence Laboratory (CSAIL). These tools were developed to ‘empower users to access, manage, visualise and reuse digital assets’. Therefore the nature and affordances of the technologies being researched were designed to align with participatory approaches and engage users in development. A participatory approach was also taken to the definition of ‘case based learning’, which was found to be interpreted differently between and within each setting (Tscholl, Tracy and Carmichael, 2009).

Within the field of TEL research there is a tendency to create a role for technology as the enhancer of existing educational practice and to fail to report ‘disruptive, disturbing and generative’ effects (Bayne, 2014: 4). This approach to dissemination has a hegemonic effect, which leads to stagnation and a lack of creativity in research practice. When uncertainty is not recognised, then changes in focus, definitions and boundaries during research can be viewed as indicating shortcomings in the practices of researchers, unclear project goals, or inadequate design processes. On the other hand, deficit might be attributed to institutional structures, academic boundaries or resistance to particular approaches to technological innovation and change. Viewing uncertainties as negative would reflect the ‘deeply conservative’ (Bayne, 2014: 4) assumptions held in TEL research where the role of researchers is seen to be that of brokers of ‘transformation’ or ‘harnessers’ of technological power (Bayne, 2014: 15). An alternative is to recognise that various forms of visible and invisible work are involved in both doing research and design and participating as researchers. We take responsibility for our participation as researchers but also recognise the limited agency of any particular participant to control the production or use of technology. Therefore, this paper highlights some of the positive outcomes of taking a research approach that creates uncertainty requiring research practice that involves continual reflection and adaptation.

## **Participatory Traditions**

The Ensemble project proposal signalled a commitment to participatory research (citing Elliott, 2009) alongside an equal commitment to participatory design (citing Suchman, 2007). This commitment was also shown within the inter-disciplinary team who were influenced by their backgrounds in Human Computer Interaction (HCI) research, participatory design and participatory action research. However, these different participatory fields do not necessarily take the same meaning from the concept of participation. They also have connections to multiple fields outside of the design and development of information technologies. The tensions between these multiple meanings of ‘participation’ have led us to examine how they were manifested in research practice for this project.

## Methodology

To support the problematisation of participation we have drawn on the non-deterministic traditions of Actor-Network Theory (ANT) (e.g. Law 2004, Latour 2005, Foucault 1973, Fenwick and Edwards 2010) to represent the fluidity of research and acknowledge the uncertainties, contradictions and struggles related to participation in TEL research. Analysis focussed on two of the disciplinary fields where research for the Ensemble project took place, which we denoted as ‘settings’ within the project group. Initially the settings were regarded as relatively bounded groups in line with a loosely classical notion of the site in anthropology. Each setting was assigned a research associate and each setting had a key informant who taught undergraduate or postgraduate students. This analysis draws on data from: Plant Sciences, and Archaeology.

In Plant Sciences a new undergraduate module was developed, which became the focus for research and development activities. The academic module leaders acted as key participants and worked with Ensemble to design a case-based module for students. This module was repeated three times annually over the course of the Ensemble research project and each iteration involved changes in the participants, the module aims, the technology and the outcomes.

The second setting was undergraduate Archaeology where initial engagement was made through a key informant based at a Museum. The Museum has a large online database and potential was recognised for this to become the basis for a semantic web tool for use in teaching and learning for undergraduate and postgraduate Archaeologists. Course structures and organisational associations were found to be complex and rich and varied in their use of cases.

For the analysis of these settings data was drawn from:

- Reflective research wiki logs of the encounters and events in the settings.
- Ethnographic observations by researchers in the field and key informants from the setting.
- Documentary data including, notes on whiteboards and images from settings, which were part of the enquiry.

## Results of Analysis- Uncertainties and Contingencies

This analysis uncovered three themes of uncertainty and contingency in participation. We have entitled these themes as ‘research settings’, ‘participatory research methods’ and ‘community’. The analysis of each theme is represented through an example based on data and our reflections on experiences from the two disciplinary settings. These examples often represent pragmatic responses to operational or organisational issues interplayed with commitments to enacting democracy through participation.

### Research Settings

Within the project group we attempted to define enclosed settings, in which semantic web tools could be developed, deployed and evaluated. Our settings were notionally enclosed by academic structures such as departments, faculties and modules; physical spaces such as classrooms, online spaces and disciplinary

discourses. But our understanding of these structures as settings was changeable and developed over time. An example from the setting we referred to as Archaeology gives a sense of inevitable contingencies at work.

In this example the structure of the setting proved elusive in its multiplicity. The focus for the research moved from a single ceramics class to include lectures and seminars in other modules as well as fieldwork and several staff and student participants. Initial engagement with Archaeology was made through a key informant based at the Museum. The Museum has a large online database and potential was recognised for this to become the basis for a semantic web tool for use in teaching and learning. The database acted as an initial focus for the Archaeology setting and was as strong a driver of our research as the key informant was. However, project priorities to focus on the use of cases in teaching forced us to widen the field for the location of the 'setting', which was intentionally left open and un-defined for the majority of the research period.

Initially, the teaching environment most closely related to the Museum database was considered to be undergraduate practical ceramics classes, which were observed to identify how the physical forms of database entries (pots) are used as cases in teaching (Rimpiläinen, 2013). But, by following recommendations from participants, further links were made across the Faculty. This led us to access undergraduate lectures, field trips and post graduate seminars where teaching was diverse, localised and varied according to the time, place and academics involved. This proved to be a sticking point, which delayed technology development in relation to this setting. It was hard to design technology without a fixed notion of the user and context of application. Later on the project goals relating to semantic web technologies influenced a refocusing of continuing research on undergraduate student 'artefact projects'. From one of the researchers point of view, this showed the most 'potential' for being supported with semantic technologies and created a suitably bounded focus for application.

This experience suggests that settings of TEL research and development are uncertain and it is the activity of investigative work and negotiating the pragmatics of project deadlines that steer temporary closures. In this example it was important to allow the definition and boundaries of the setting to be wide and flexible to allow for participation of a variety of staff and students and for the focus to be steered towards the use of cases in a complex teaching and learning environment.

## **Participatory Research Methods**

The drivers of research practice are examined here to draw out uncertainties and contingencies related to the concept of pre-fixed methods for use in TEL research. There is a danger that the translation of methods from participatory traditions into new contexts and settings is simplified in accounts of research practice in order to adhere to conventions and increase perceived validity (McTaggart, 1996). In Ensemble research we did not adopt a set of methods and transpose them literally to and between our research settings. Methods needed to be re-interpreted for the different settings due to contingencies inherent in engagement with academic timetables, key participants and student users. Ethical considerations also had a strong influence over our choice and development of research methods. This required us to use our understanding of the different contexts and reference to prior experience to consider ethical issues alongside methodological deliberations (Tracy and Carmichael, 2010). An example from Plant Sciences shows how our methods were uncertain and contingent.

In Plant Sciences a new case based module was implemented over three successive semesters enabling iterative development of the pedagogical and organisation structure of the module. Understandably, the emphasis was always placed on providing a supportive environment for student learning and tensions were always present about how Ensemble researcher goals may affect the student experience. One academic ([E]) openly discusses these tensions in this extract from a planning meeting ([E] Interview 27/01/09): "Don't let them feel like guinea pigs that are being used as experimental animals...The big idea is that, if you like, this is a new way of learning. And we want them to get the benefits of that new way of learning. But, at the same time, we'd like to monitor and follow and track how this develops. Are you with me?" Sensitivity to these concerns led Ensemble researchers to focus their presence in the setting on organisational and technological support rather than implementing structured research activities that could be interpreted as 'experimental'. However, research project goals created a need to gather some form of observational data to allow analysis of student group working practices and evaluation of the technological support. This was negotiated with lecturers and it was

decided that the most unobtrusive method would be to ask students for their consent to make digital audio recordings of student group meetings and invite them to an informal focus group for evaluation once the module was complete.

This example shows how flexibility and sensitivity had to be applied to the implementation of research methods. It was not possible to implement formulaic plans, instead, situated action was needed. Critically this meant knowing about different participatory approaches and translating possibilities into practice.

## Community

This analysis is concerned with acknowledging disjuncture within notional participatory ‘communities’ and the uncertainties that come along with identification and classification of groups for structuring research activities. This was shown through differences in understandings of researcher identities and roles and issues with identification of communities within settings.

Participatory practices in Plant Sciences were greatly influenced by the backgrounds and perceived identities of the researchers and academics involved. One of the Ensemble researchers was a former student and researcher from the Plant Sciences setting itself and one of the academics involved in teaching the module was also a co-investigator for Ensemble (labelled as [A] in excerpt below). Although this was key in enabling the involvement of Ensemble in this setting and it helped to keep the disciplinary and research goals in focus. The following comment made by the Ensemble researcher during a planning meeting illustrates that it produced some confusion and tension about where priorities and identities were being placed: “What I was trying to work out, is what role [A] is playing. Because if... you’re the practitioner, I’m the researcher and I understand that and I want to get more involved with running the course and stuff. And I can give you a lot of time this next couple of weeks.” (Planning Meeting, 27/01/09). In practice the researcher acted as administrative support for the module as well as arranging digital recordings for observation of student group work practices. Other members of the Ensemble research group provided technological support and were included as part of the module team supporting students in their engagement with this new way of working and learning. Identities remained blurred and flexible throughout and roles changed with each iteration of the module. Both the key researcher and academic involved in research are likely to have identified themselves as ‘brokers’, but the communities that they worked between were in flux and had little sense of a negotiated and stable disciplinary practice associated with case based learning.

The Archaeology setting gives an example of the difficulty of defining ‘community’ within a diverse and dispersed field. The key informant in this setting ([F]) explained ([F] interview 08/05/09) that the access to a global scope of researchers who teach was seen as an unusual and valuable resource in that Faculty. However, this variety also created difficulties in keeping the links between different groups of researchers, lecturers and museum archivists active. Brokerage activities were hindered by the lack of definition of a ‘community’ that could be engaged in research or enrolled in helping to integrate technology with teaching. The museum archivist ([G]) reflected on this in an early interview:

“although we are still a faculty we are much more separate...and that has made a huge difference so there is much less communication between the departments...the museum is now a separate unit and it didn’t used to be. And so one of my fears is that the actual objects will get used less and less and I think we are the only university I think probably in the whole of the UK that can teach Archaeology in the way that we do that has its own tame Museum as it were, right next to the Department.” ([G] Interview 17/11/09).

This dispersal caused difficulties for Ensemble researchers and introduced uncertainty to the vision of an Archaeological ‘community’ which could be engaged in technology development leading to implementation in teaching.

The communities that have recognisable labels like Plant Scientists and Archaeologists are not necessarily cohesive or coherent. Work was involved in enabling the ‘settings’ to emerge as viable sites of research and the same applied to community. Struggles took place over who to include and exclude from project definitions of

‘users’ and ‘settings’ and advocates within the Ensemble research group were needed to argue the case for definitions of these temporary boundaries. What we are suggesting is that there is no community of users ‘out there’; communities can emerge from networks of relations, but the direction this can take is by no means certain.

## Conclusions

Through the analysis of research practices taking place in two settings the contingencies and uncertainty inherent in our participatory TEL research have been highlighted. Three themes were identified that represent participatory constructs that were found to be fluid and contingent. Findings show that the pragmatics of project deadlines, institutional structures, and cultural attitudes to innovation or change affect the boundaries and classifications of settings. Suitable procedures and methods for design or development are hard to pre-empt and need to be adapted and translated to suit the culture and structure of the research setting. Also, ‘users’ have complex identities so that community definitions and boundaries can have a confining as well as enabling effect.

Being able to take flexible action in the face of these contingencies was a strength of our research, and allowing for reflection and adaptation in the face of uncertainty enriched the processes and outcomes of the research. In many of our settings a rigid approach to the definition of users and community would have stalled the research prematurely or limited the scope of the technology that was developed. Unless settings are theorised as fluid and contingencies are expected, participation in the setting becomes a form of hegemony, which hides or undervalues the subtle work of finding a place for new technologies within dynamic teaching and learning practices. Equally, following a prescribed approach for research methods could have created data and led to technology development that was inappropriate for the context. In this kind of multi-institutional and interdisciplinary research environment it was essential to be reflective and adaptable to be able to effectively reach project goals of the creation of new technologies, pedagogies and practices.

This also highlights practical implications for how research is planned and managed. The natural uncertainties need to be acknowledged and considered in approaches to research that allow for investigative work and space and scope for reflection and experimentation with a range of research methodologies. Our approach could be described as having been open to a variety of methods that enabled us to ‘design with participatory research’. The role of researchers for this project was to find strategies (or develop new ones) for bridging multiple, complex and variable worlds (Carmichael and Jordan, 2012).

Even radical shifts in theorisation of participation and intervention are open to being mythologised, or made invisible. This is possible when TEL research is constructed as an intervention in a world that is more or less stable and known before, during and after the technology is produced and put into that world. A different ontology is advocated here; one that makes the case for greater awareness of the uncertainties and contingencies that are part of the work of achieving technology stabilisations. In this, both ‘doing research’ and the ‘participation of the researcher’ are positioned within the network of working systems that make technology stabilisations possible. Designing with participatory research can be understood as continuous reimagining of TEL possibilities. This has wide ranging implications for how design and research are imagined, conducted, reported and evaluated.

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