

PROBLEMS AND OPPORTUNITIES OF INTERDISCIPLINARY WORK INVOLVING USERS IN SPECULATIVE RESEARCH FOR INNOVATION OF NOVEL ICT APPLICATIONS

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Abstract

In this article we focus upon some challenges of multidisciplinary teams working interdisciplinary¹ in research for innovation of novel ICT applications. We start by defining some general challenges of especially social scientists when working interdisciplinary. The formulated challenges are grounded in our personal experiences. In the next part of the article we focus upon research methods that are used when involving users in the research of novel ICT applications. We shortly describe the different methods and the value they have for social scientists, designers, marketing people and engineers. In the latest part of the article we argument why, from our opinion, using this speculative research methods involving users can help facilitating interdisciplinary work.

Keywords

Interdisciplinarity, multidisciplinary, innovation, speculative research, creativity, user, method, design, industry, academy, applications

1 INTRODUCTION

As professionals we are increasingly finding we have to cross traditional disciplinary and institutional boundaries, such as between academia and industry, between science and design. We are sharing methods and tools between disciplines, but it can be easy to loose sight of the motivations and intellectual foundations of these methods, the tacit knowledge at we bring to their use, and the wide variations in how the results of investigations and interventions are interpreted. We need to better understand these divergences, identifying pitfalls, but also highlighting the creative and analytic opportunities of this approach to working.

¹ In this article we define ‘interdisciplinary’ and ‘multidisciplinary’ as following: *Interdisciplinary* is an adjective describing the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organizing concepts, methodologies, procedures, epistemologies, terminologies, data leading to an organization of research and education in different fields of knowledge (disciplines) with different concepts, terms, methods and data organized by a common effort working on a common problem with continuous intercommunication (OECD, 1973). *Multidisciplinary* is a juxtaposition of various disciplines, sometimes with no apparent connection between them. E.g. mathematics + music + history (OECD, 1973).

This article contains many personal experiences from our own everyday work life. Therefore it seems important to briefly situate ourselves. Laurence has been working for just over two years at Alcatel-Lucent Bell Labs in the department for research on innovative applications. Previously she studied sociology and interdisciplinary gender studies and obtained a doctoral thesis in communication sciences. She experiences every day what it is to try to do some ‘proper’ interdisciplinary work in a telecommunication company. James has been working as an academic researcher in STS for over ten years, after studies in electronics and STS, working as the social science researcher in a number of multidisciplinary projects, particularly EC framework programme projects with industry and academic R&I researchers. More recently he has been involved in collaborations with groups of academics from design, architecture, geography, engineering and informatics conducting rather open-ended and speculative design-led research with no expectation of producing commercial outcomes.

More and more boundaries are being crossed between institutions and disciplines when researching for innovation² in the field of novel ICT applications. Among others Intel, Nokia, Xerox, Google, Yahoo and Bell Labs have decided to involve other professionals apart from engineers in their research work. Although some companies have been working with multi- or interdisciplinary approaches for more than ten years, a clear methodological interdisciplinary framework for innovation research within companies is still not defined. The added value of bringing together different disciplines is seen, but they cannot exactly point to the how and why’s of the value. Different ways of working therefore exist next to each other: a separated ‘human sciences’ department in a company, multidisciplinary and interdisciplinary teams in a company, an engineering company paying an academic social science research group or a consultant to do certain research.

There is a growing body of literature that focuses on the difficulties of work in multi- and interdisciplinary teams, citing issues of epistemological difference [9], conflicts of identity, group membership and cultural capital [6], misaligning of concepts and terminology [3], lack of openness to approaches and ideas from other disciplines [8], power issues [11], structural biases and failure of management. However this type of teams is constituted because it is recognised that their varying skills and knowledge are necessary to conduct research for innovation, in the same way as labour and knowledge is divided in most other areas of human endeavour. We social scientists are concerned with interdisciplinary work involving research with ‘users’. Our question is not only what difficulties can arise in interdisciplinary work involving research with ‘user’, but also what ways the methods and outputs of user research can act to make interdisciplinary research successful.

This article is presented in three parts. First we define some common challenges when working in interdisciplinary ways. These challenges will be illustrated with personal observations (Laurence) made during her first months work within Bell Labs, and will be situated in a broader discussion. Second, we summarise a range of methods involving users that are used in speculative innovation research, and their value for different disciplines within a team. These descriptions are formulated out of our work experiences. Third we will attempt to formulate a way that user research can act as tool for making interdisciplinary research a success.

2 PROBLEM DEFINITION – SPECULATIVE RESEARCH FOR INNOVATION

Innovation is a long and complication process – can start with research and then development, but usually takes many years, and passes through many hands before becoming a successful innovation. Research into new applications of ICT is therefore not looking to provide definitive answers, but to explore the uncertainties of the world, and the possibilities of change produced by bringing together people and technology in novel ways. We term this “speculative research for innovation” – speculative since it’s inventive and involves imagining futures different to the present; research, since it involves scientific methods and the exploration of the unknown and the novel; and innovation, since it is directed at informing and stimulating innovation.

In this paper we address work done in research teams conducting speculative research for innovation into novel ICT applications. This work is not primarily aimed at producing new products or services – that is the work of development teams drawing on research and more immediate business needs. Research is more open-ended, experimental and uncertain. Research is about asking questions, formulating problems based on those questions, search for ways to answer those questions, analysing results and exploring how those problems might be addressed. It sometimes produces some type of answer: in the form of a technical artefact, a business plan, a report on human activity or a new analytic framework or theory.

² Research conducted with the aim of stimulating or informing technology based innovation. It is often seen as research-led innovation, although this makes certain assumptions about how and when innovation actually happens.

Penny [10] suggests that many people trained in analytic disciplines, such as much of engineering (who are applied scientists) are less equipped to formulate problems, but focus very much on providing solutions and answers (generally in the form of an artefact).

It is not surprising then that speculative research that involves the speculative attempts to bring together technology and people is difficult to integrate into the still existing dominant V-model for innovation within the engineering methodology. Until recently, the process used to develop an innovative application was considered a linear process. After a process of requirements capture, specifications are defined, then development of a lab mock-up and then the design and implementation of the GUI design. The designer community has adopted this software development process; they integrate design methods and user tests in the different defined development phases of the V-model (UCD Design research cycle). This is probably the core reason why the extension of the engineering team with designers happens relatively smoothly. Currently the more and more software development is using the agile programming methodology instead of the traditional 'heavyweight' software development methods, like the waterfall method when developing new ICT applications [2]. This iterative process creates opportunities for social scientists to be involved not only in 'requirements capture' but to influence the development process during different stages of the programming work.

There are generally four main disciplines brought to bear in research on speculative applications of ICT: engineering, design, social science (e.g. anthropology) and business development. Each has its own approach to formulating questions and providing answers, methodologically, cultural and even philosophically. They also have different tendencies to reflect on these practices. We first start with some general reflection upon interdisciplinary work before we focus upon the user related methods.

3 THE CHALLENGES OF INTERDISCIPLINARY WORK

Interdisciplinary teams have a hard job. Visiting unknown grounds and communicating with all these strangers is rather painful. Anbar [1] names the researcher doing this sort of work 'bridge scientists'. His description of four types of bridge scientists (the adventurous once, the marketing once, the problematic once, and the less enthusiastic once) sounds very familiar looking at my (Laurence's) own team.

The feeling to be a minority is normal when you are one. There is a chance one can be tolerated but not accepted by the group. The good thing is that you don't have to compete with the others on their discipline; the sad thing is that you cannot do your job properly when you are not part of the group. The first challenge of interdisciplinary work is becoming part of the group.

When entering Bell Labs as social scientist I kept a diary to reflect upon my experiences. Now, two years later I re-read the diary and analysed it in the context of finding the challenges of interdisciplinary work. I will quote from my diary to clarify some of our ideas. I start to admit that all of the challenges I encountered at the start of my work are still there.

When I wrote this for example, I was wondering how I could ever become part of the group, if non-engineers were perceived as this:

"A remark by J. was very funny, he said 'even people can use it'. And that's what it is. They want it simple and intuitive. But is this what people want? And aren't engineers also people?" (16th October 2006 – my 16th day at Bell-Labs)

In the next pages different challenges of interdisciplinary work will be described and will be illustrated by my diary quotes.

3.1 The feeling of misusing research methods

After many years of academic study and application of carefully developed and argued social research methodologies, it can be hard to enter an industrial research environment where concepts and methods are picked up and tossed around like toys on the beach.

"Co-creation and what it means there is here now the talk. However, sometimes very much from the angle 'we use the ideas of the users'. But will they also ensure that the users-designers gap may be deleted without stereotyping groups? Or is the aim to put people in clearly defined boxes?" (4th October 2006)

“The day started with a talk with the usability engineer who gave me a pile of information on prior studies that have happened in the team. I think they remain very strong on the high-level interface, so a layer on top of the application rather than on the application. But it was very kind of him to share information with me. A real overview of questionnaires used, methods, research, etc. is not available, and the once I saw where far from scientific correct.” (10th October 2006)

“Yesterday it was clear that the interview process the university is using, is not very scientific. It seems to me that the staff of the university together with the engineers of Bell-Labs are too close involved in the user-research. They are so intertwined that it is very difficult to do research I think. Maybe they should change to participatory observation as a method? But of course the power relationships are very strong. It is an impressive project, but it seems to me almost more something for a marketing company to launch than to do with academics and engineers.” (20th October 2006)

When working in an interdisciplinary team we are sharing methods and tools between disciplines, but it can be easy to lose sight of the motivations and intellectual foundations of these methods. We often have the feelings we are denying our own discipline. This is not evident, but it starts getting really difficult when we feel that a scientist from a different discipline is using ‘our’ methods in another (‘wrong’) way.

3.2 Different feelings about time

As social scientists we are learned to work in research cycles that can take different years. This seems in contradiction with the time schedule of creation of novel ICT applications in R&I. Eyes can look really shocked when you tell researchers in industrial innovation research that you need two years to do your research...if you dare to tell anyway.

“Trials must be done in three months, focus group interviews, surveys, ...are these useful methods to implement something that does not exist? I fear that I will not be able to explain that for 'good' scientific research you need more than three months.” (5th October 2006)

“What I hate is that everything should go so quickly. How do you do user research if you have 14 days to prepare? How can you say something about research when you barely have time to analyze them? How can you master the methodology used if you do not have time to read? Or do a proper literature study before you start your research.” (20th November 2006)

Doing interdisciplinary research where we can learn from each other means that a certain alignment in timing of the research happens. Because the core of the research still is to develop new applications and engineers are most often in the majority, other disciplines are supposed to adjust to their timing. The fact that the development of the ICT application, the software development particularly, has a total different timeframe than mainstream social sciences research makes the use of certain methods problematic or impossible.

3.3 Starting from no-thing

As social scientist we have learned to explain every decision we take during our research. We should say in advance why we undertake certain steps in certain directions. But when doing speculative research it is difficult to justify what you are doing when you do not really understand it: understanding in advance is not always needed, you change by doing

“But everything is innovation, even the technology does not yet exist. So combining other existing technologies makes the prototypes, weird, I'm used to examine existing things. I am not visionary, I never was. It points to a form of arrogance, which I dare not. Alla, but we will see.” (9th October 2006)

As social scientist we are not used to ‘inventing’ new things. This is far more the case for research engineers. Just the choice to be such kind of engineer makes them interested in creating or inventing new applications. Knowledge about existing technological trends and tools seem important when looking at the future. For social scientists this is a domain where they are strangers.

3.4 Compromising your discipline away

The academic world in general is most often not enthusiastic about interdisciplinarity, social scientists in academia have another bias, and they seem to find the use of their research methods for applied sciences as inferior. An 'applied science' version of the sociology or communication discipline for example doesn't exist. The result is that you, once you are employed in the industrial world, are rapidly alienated from the academic world because you no longer conform to the standards of the discipline.

"The question is how you can get respect within the academic or scientifically world, combining it with speed of research in Alcatel. The only possibility is to formulate the clear boundaries of the research. It will then need some puzzling to get publications or to get something fundamental new of research results". (20th October 2006)

"Also discovered that discussing with other brain can really be fun, very tiring, but fun if there is openness from others. Translating the thinking in models into communication about thinking about people and how complex and unstructured it happens. Now I know that on the one hand I must be aware not to limit my thinking with 'their' thinking. But can you talk to each other if you don't even know their language? And is it still possible to think freely if you do understand them? Or do you get too much limited by their thinking in models? I am wondering." (3rd November 2006)

Linked to 3.1 these quotes formulate the importance of staying in contact with your own discipline. Not only do we, as researchers, need the feedback and acceptance of our research by our disciplinary colleagues, we need to stay up-to-date with the existing body of literature. We should be professionals who are strongly grounded in a particular discipline, having satisfaction in terms of scientific curiosity and recognition by their peers. But we cannot only stay in our discipline; we have to cross borders if we want to work interdisciplinary.

3.5 Modelling and processing the world

The other members of the team have particular idea about what type of results they want from user research. For example, the business developers want figures to write a business case, or stories to sell their concepts. The designers and engineers want models of how people work, and material to write a complete and hermetic scenario to draw up requirements.

"They put the idea of a new application in a scenario, then they make a comic about what happens in different interaction steps to understand and then they start to write an architecture. So this means that on the basis of that story about a loving couple, a technology gets developed? That planning totally in advance is strange. Isn't it possible to implement something already without planning everything in advance?" (17th October 2006)

"Mental models? Where the hell are they talking about? Exists there a mental model of a man or a group of people? Can everything be put in a model? I can give them 1000 models, but a model is always only one possible representation of a process, structure or mechanism? It never tells the truth, but why is it thought that everything needs to be in a model to capture? And is everybody eagerly waiting for this model to be formulated by me before they go on? Ah, strange birds still here and sometimes very frustrating." (31st October 2006)

"Another problem is the marketing side. How can I make it clear that marketing and sociology are very far apart? I cannot promise to make a 1 million euro case, I can only investigate what and how things happen. I can no way tell whether people will want to pay or not, and how much. Not my questions." (31st October 2006)

It is clear that cognitive models of action are not very appropriate in research for innovation of novel ICT applications. Authors like Suchman [12] and Leigh Star [4] were namely very convincing in their vision on the importance of particular circumstances and situated actions because of the fact that significances of artefacts are related to the circumstances of their creation and their use.

What became clear when observing the new team I arrived in was that with ‘classical’ use of social sciences methods we would never achieve the goal of innovation of novel ICT applications. From the other team members there was also not much interest in reading social science literature, research reports I wrote or theoretical discussion. The encounter point of the different disciplines in their work was mostly found when using creative methods. Brainstorming, the use of the COCD box³ that divides a brainstorm in a divergence and convergence phase, inspiration cards... this were tools that without problems were used and were perceived as inspiring by all team members. Also when working with users these methods were successful. The problems mostly arise when (a prototype) of the novel application was set-up in a ‘real environments’ for creative purposes. The reasons for this will be multiple: unstable prototype, no proper GUI, too much focus on the technology from the users-side, a gap between what users are thought to be able to do and really can do, the narrowness of the prototype (mostly only some features are integrated in the prototypes). But creativity seems to be from major importance when doing speculative research, it uses another then the disciplinary language, tools and forms.

4 THE CREATIVE TEAM

My (James’) more recent experience, after doing multidisciplinary work with engineers, was to work closely with other researchers more used to working in the disciplines of design and engineering for design. Unfortunately I did not manage to keep a research diary... although latterly we did take to recording video blogs of the outcomes of our meetings.

The principal issue I found was to move into a speculative design world, but in a team that was torn between playing with new technologies, developing new applications and exploring social science research themes.

4.1 From observation to intervention

A key approach in the academic-design world I (James) found myself was the ‘intervention’. This generally involves creating some sort of out-of-the-ordinary event, such as placing an object in a public place, or bringing people together to experience something unusual. It has elements of performance – the ‘artist’ designs the intervention, but what is sought is the reactions of those who wittingly or unwittingly participate in, and therefore are co-creators of, the intervention. They may be observed, filmed or interviewed, or even asked to make more active contribution. My first experiences were with a group of 30 academics from many disciplines, holding research events in ‘non-places’ a DIY superstore and an airport, where we talked to staff and customers, made presentations, played games and tried to look under the skin of the place. Part of these events involved minor transgressions, which nearly got some arrested, and the production of large numbers of photographs and videos. While I found these events interesting and stimulating, but certainly not a research method despite having elements of participant observation, interview and design, it became clear that for many participants this was a perfectly valid method, and could be the basis of a whole research paper.

This project was considered so successful by funders that a new project was funded that was based around the concept of research by design, and ‘designer workshops’ – interventions that would involve the careful planning of in depth design sessions that were intended more as interventions than opportunities to produce working designs. However the planning and doing of interventions was challenging methodological for me, as someone brought in with expertise in talking to ;’users’ on their use of technology. I had to do a great deal of work to make the practice fit in with my ideas of how to talk to people with other ideas of the ‘active user’ and co-creation. There was no space for long user trials, just short (2 hr to 2 week) experiments, where the outcomes were not meant to be careful evaluations of the benefits and problems of a particular system, but new ideas and directions for subsequent explorations. We did need some formal ‘user research’, but I was particular challenged by the project leader suggesting that – we need some user research – lets get some people into ‘Second Life’ and get them to talk about it for a few hours.

Eventually I managed to situate myself much more in role of facilitator, and active participant. I found myself asking the other team members to step back from the conversations with the user-designers, as they were always tempted to interrupt and put their own ideas in without listening. There was a constant tension over our role – when should we be observers, and when should be take on a dual role as designers and as observers.

³ For more information on the COCD box: www.cocd.org (in Dutch).

I am not convinced of the value of much of the collected ‘user data’, but at the same time, satisfied with changing my skills and using the experience to develop much strong ideas on the possibilities of involving ‘users’ in speculative research.

5 PRODUCTION AND USE OF KNOWLEDGE ABOUT ‘USERS’

This paper situates the issues of interdisciplinary work in the context of research into novel applications of new technologies, and in particular around practices that bring potential users and knowledge about users into the development process. It is therefore useful to frame it within a model of the role of users in design and development. We use the Social Learning in Innovation approach [14] and a concern for the representation of the user [13].



Figure 1 Sources of Representations of Users [14]

Information about potential users of future products is very important, both practically, and symbolically. Development groups have many sources of user information - some from past experience, some from direct work with potential or proxy users, and others from personal or professional constructions of what users are like and may or may not require. Speculative research on technology application is rather different from requirements based research, where suppliers can work with known customers to develop requirements, and work with them to fine tune them. Speculative research departs from visions of technology or the world, and attempts to engage with both in rather experimental processes. The ‘users’ are initially unknown, and potential users hard to identify, and often hard to engage with. It is in this sort of R&I that interdisciplinary teams are important.

While R&D staff can attempt to ‘go and ask what people want’, it is equally likely that technology developers will observe: ‘people do not know what they want, it is not worth talking to them – just invent something and persuade them to buy it!’ This is what Limonard & de Koning [5] call the dilemma of user involvement because users cannot always articulate their expectations or predict what they expect to do with certain devices or applications. Of course in many respects it is true, most of us do not know what we want in terms of a new technological product or service that departs from very established existing provision. However, to suggest that therefore we should not, or need not engage with people who might use our services and products is ridiculous. The predicatory value is not the only value of user-research. Human-centred design techniques, Requirements Engineering and Marketing techniques are of course the techniques of designers and engineers and business analysts that are deployed to actually do this.

We engage with potential users, because in the world of uncertainty, and often unsuccessful innovation, knowledge about ‘users’ is seen as very valuable, and has great currency within innovating communities [7], being passed around departments and up hierarchies to inform or corroborate decisions, and to illustrate the veracity of business plans and future prospects of technical artefacts.

“The boss told me that with the innovative applications they doesn't want to repeatedly adjust the male buyer of 40-50 years, but want them for different audiences available. They want to convince the business division of the usefulness of that application by doing user research. My job is partly to develop a methodology to investigate this”. (3rd November 2006)

However, as the figure above illustrates, there are many sources of knowledge about ‘users’ [14], in the hands of different professionals, derived from a range of sources. As social scientists we hope we have scientific and moderated methods to obtain, assess and use knowledge about the people we study, but it is dangerous to assume that we have a monopoly over this sort knowledge, or produce the sort of knowledge that is actually useful. Even if we do, there is a clear problem with our ability to communicate this knowledge to those outside our discipline.

5.1 Let’s go and talk to the user

We have both had the challenge of working in multi-disciplinary teams, doing ‘interdisciplinary work’, charged with providing knowledge about ‘users’, but having to fight for the space to produce it adequately, and to manage its use.

At its simplest we can say about taking users in the research cycle: “lets all go an talk to users, then we will have a shared understanding of their problems and be able to come up with some solutions”. In practice and theory this is highly problematic and raises lots of questions, it also let us question our own skills and professionalism. What is the role of social scientists if engineers, designers and business developers can talk to users directly? Have we been educated for four years or more in our discipline, just for something everybody can do? And if not, how can we explain our added value?

And when the other way around, when people think that the job of talking to users should be delegated to social scientists who will supply them with material on which to work, is also problematic. Social scientists are generally trained to study people, while other disciplinarians are not (with caveats for market research and human-centred design). But how can we explain there are lots of questions without answers, or that answers are much more complex then they like them?

“I have a feeling that I didn't even had to defend my research proposal. But I don't trust it. Now they are sending me 1000 more research questions I should answer in my research. How can I make them clear this is impossible?” (17th October 2006)

When we look more concrete at the doing of research we see that each disciplinary has different methods of engaging to ‘users’, if they have methods at all. These will often be very different, to do with training, goals, and required outputs (e.g. marketing surveys need number to go into business models, design ethnographies need concepts and ideas to stimulate design, engineers need to identify problems to solve and requirements to satisfy). Getting different team members to work together is likely to be tricky. So how can we use the same method in a satisfactory way that works for the different disciplines? The choice of a method is, from our opinion, based on the research questions. But this is not the opinion of the whole team.

“I received more comments on the slides that I submitted, which is good. But they are not necessarily from the corner that I expected. Starting from research questions is clearly not the normal course of business here. The non-technical research they did until now, I think, was particularly creative, and they also did some usability research. Both are important, but it doesn't stop there of course.” (20th October 2006)

But we see that very often a method is chosen just because researchers liked it, not out of a decision that this is a valuable method for finding the answer on particular research question. And although different methods can sometimes be used, it is also the question how to use it.

5.2 Choice of methods and value of outputs

When doing interdisciplinary work involving users in speculative research into novel ICT applications we draw on methods used in design, marketing and social science, such as cultural probing, participative observation, participative design/co-design, scenario building with users, long interviews, focus groups, surveys and then use this data to build models, create personas, tell stories, create scenarios, develop theory and extract requirements.

These methods have very different time scales – long-term engagement with a community using multiple methods versus an afternoon in the park with a camera. Most non-social scientists have not had research training or experience to develop good fieldwork techniques and therefore incorporate existing social sciences methods ‘badly’. (Wynne [15] gives a good example on her blog: “the way designers discovered ethnography as a “method” without adopting the premise behind ethnography: social context is everything, not just an extra factor that can be bolted on, but ultimately has to be designed out”). This does not necessarily mean they cannot get something out of the experiences, and we cannot learn from them either. And for sure social scientists are usually not good at engaging with inventive practices of the respondents and here we can learn a lot from the practices of designers.

In the following we look at the relationships and outputs of investigations and interventions conducted between fields of practice and knowledge, and suggests ways that they can be overcome, methodologically and practically. The methods used for user-involved research appear to be similar, but the training in their use, expectations of outcomes, and use of the experience and results can be quite different. In the following table we make a first step in creating an overview of the most commonly used research methods and the generated value for the different disciplines. There is a need to better define and understand these divergences, identify pitfalls, to create the possibility to also highlight the creative and analytic opportunities of these approaches of working.