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Users as Currency: Technology and Marketing Trials as Naturalistic Environments

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Bringing interactive multimedia services to the home and to the mass market continues to be the well-publicized ambition of the large media, telecoms, and computer corporations. However a number of major difficulties and uncertainties are still to be resolved concerning the technical delivery systems, about the generation of programming "content," and, perhaps most critically, about the market for these services. To try to gain more understanding about these issues, organizations, singly and often together, have been drawn to embark on a number of technology and marketing trials. Trials have been driven by the deep uncertainties about demand—about which kinds of services will be attractive to future customers, and about what they will be willing to pay. These call into question the viability of such projects. These are often very large-scale undertakings, involving many new innovations, and requiring enormous investments. In this context the "consumer-user" is largely a fiction in the proposal stage of many of these projects. As rhetoric, consumer-users are used as a currency for legitimating not only particular operational visions of the technology but, more essentially, the visions of the overall viability of the project.

On a much more concrete and manifest level, trialists—surrogate consumer-users—are endowed with the power to animate and hopefully authenticate these visions. Their "knowledge-producing" capacities place them in direct relation to the technological potentials of the system. Viewed in this way, trialists, or more precisely their potentials to produce knowledge, are used as collateral in deals forging new partnerships between firms interested in developing competencies in using the technical system as a new channel for their business. Feedback from trialists will inform ongoing development decisions relative to the initial market visions and the exploitation of the technological potentials of the system. Trials are truly sociotechnical systems, where the potentials of knowledge production from trialists are in every way as critical to evaluation as the communicative potentials of the technology.

This article presents an overview of one such trial in the United Kingdom, the Cambridge Interactive Television Trial, which at its time was viewed by some as the most technically advanced of its kind. The trial would allow participating companies to gain access to the system, and to develop and implement technology and content. It offered broader opportunities to learn on two dimensions:

- How to form creative and business partnerships necessary to support online services (i.e., involving technology providers and content and service suppliers with their different traditions and areas of expertise).
- How to gain insights into the reactions of users of the system to the technology and content.

This article attempts to summarize how the trial evolved, viewed as a sociotechnical development. It examines some of the difficulties that arose in the course of the trial, particularly in relation to the study of users. It explores the reasons underlying this: in particular, how lack of attention to organizational matters in trial management, particularly governance issues, impacted upon the successful implementation of a relevant user-consumer research program.

MASS-MARKET AMBITIONS FOR INTERACTIVE TELEVISION

The 1990s have witnessed the maturing of multimedia technologies, as well as a revival in the idea of making the ubiquitous television interactive.[1] The business assumption for this is obvious: Broadcast television, with its almost total penetration into homes, will act as the vehicle for accessing new types of services and content. To do this, consumers will need some sort of set top box (STB), which will decode a data stream coming over some sort of network provision, most likely the digital satellite, cable

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networks, perhaps using the existing telephone system (plain old telephone system or POTS).[2] Consumers are likely to pay something for the box (which may be subsidized by the system operators), and they will pay something for network access. TV-centric network technologies are symbolic to computer developers of the so-far elusive "mass market." The belief is that there is considerable latent demand for interactive services by television viewers. However, this belief has largely been built on what developers know best: technology development.

Most fear in the new media market place is not derived from problems of processing power, bandwidth, content, and connectivity, but rather from the uncertainty regarding the citizens of "television land." Some of the perennial questions over the last few years are: Will they or can they accommodate the significant changes to how they shop, view, play, pay, and learn? How will they actually situate and really find value in new media within the course of their everyday lives and activities?

These problems concerning the design, manufacturing and marketing of new media production were compounded by a number of significant organizational dilemmas. Recent years have witnessed considerable difficulties concerning how to build effective strategic alliances bringing together diverse players involved in content and technology provision. There is growing awareness that the move towards large-scale interactive television service, or any other "mass" new media service, will present a range of deeply significant and novel problems. These will emerge in both the cultures of production (graphics, interface design, transmission and reception, etc.) and the cultures of use (how one interprets and finds meaning in what is represented). However, as is crucial to the effectiveness of all media performance, the most pervasive question is how to effectively straddle both cultures in a meaningful and productive way.

Regardless of the scope and scale of these problems, the technology pundits of interactive television stick firmly to the idea that somehow functional enhancement of broadcast television will magically motivate people to subscribe to, and use, interactive services. New revenue streams will flow from the use and consumption of these offerings, and from a range of new advertising opportunities. This will eventually stimulate demand for more bandwidth on the network. Network operators will then have a much more solid business case on which to base their network infrastructure upgrade strategies, this drives system upgrades ... everyone lives more happily ever after.

TRIALS

However, uncertainty about consumer acceptance, and the need to showcase technology and test organizational alliances, have led to the launch of a number of extremely expensive new media technology and marketing trials worldwide. The logic underpinning trials is to test technology and markets through prototypical testing in *semi-naturalistic* business and living environments.

Technology and marketing trials comply with Silverstone and Haddon's (1996, p. 44) observation that the innovation of technologies is not just a matter of production; *consumption* and *use* are "equally essential components of the innovation process." Similarly, Johnson (1986) and others coming from the British cultural studies movement (such as du Gay, 1993) have described the way in which artifacts develop and produce meanings for various actors as a *circuit* of production, circulation, and consumption. As products are created, regulated, and diffused into the public domain, they are infused with (sometimes varying) meaning. However, trials are in a sense cultural "biospheres." Trialists may not be truly representative of wider publics or "actual" consumer-users. Firms nevertheless believe that they can provide some indication of their receptivity toward the technology and its integration (or nonintegration) into their lifestyles and activities, can present valuable insight into further innovation and business strategy.

Absolutely essential to trials and other forms of testing are the people who will view the product, content material, etc., make choices, operate and use the technology, view the contents, use the services, and so on. Prototyping and beta testing and such are established methods by which producers and marketers attempt to gain knowledge of the experiential aspects of new products in situ, via feedback from users. Based on their already established behaviors and perceived needs, it is anticipated that they will cope with the idiosyncrasies of a new system or service in a way representative of how a wider population would react to it. To be appropriate as trialists, they must use the technology, and they must also *act* as consumers of the content and services in as naturalistic way as possible.

These two aspects of trialists—their potential as representative users and consumers—are reflected in the temporal organization phases of many trials. Initial phases are often characterized by an exploration of the technology, while subsequent phases usually have some sort of exploration of the potential commercial value of its technology, services, and content.

In the first instance, that of the *technology* stage of the trial, trialists serve as *users* of the technology, and they may provide overt (through questionnaire surveys and interviews) and covert (through system-logging technology) data regarding the systems qualities and operability. This draws attention to weaknesses in the design of the system and its constituent technologies, such as problems of usability. Firms also learn through tackling problems that are totally independent of the actual use of the system, such as the logistics and technical difficulties in connecting dispersed households, problems of compatibility of system components, problems with "head end" technology, problems with the switching technology, and issues

related to transactional aspects of the system. The social and economic dimensions also emerge through the actualized problems of forging successful technology partnerships, cutting costs, and so on. Here, trials propagate mainly cultures of production.

Trialed within the naturalistic environments of their homes and lifestyles, use and consumption of new media give rise to impressions and speculations that can inform and legitimate proposals for changes to the system and content. Trialists, then, are considered intelligent (if not always sentient) parts of the technical system. They provide objective data with respect to system performance, and subjective data with respect to content and their impressions of using the system. In the later marketing phases of the trial, for instance, they are expected to feed back information on pricing and value of system elements. The assumption is, of course, that they will be attracted to use the system, as well as be able to rationalize and articulate their experiences through the means and methods of data collection. Here, the technology and content of the trial propagates a specific culture of use, which with the correct means should cast light on a generalized culture of use. What is interesting here is the shifting role and identity of the trialist over the phases.

In such models of diffusion where trials are viewed as the "launch pad" to the wider marketplace, it is the promise of real subscribers, real user-consumers—those who will actually use and pay for the system, content, and services—that drives business plans. As in the marketing of any other product or service, or indeed blockbuster movie, the promise of the mass forms a major part of a symbolic currency used at the inception of the project to enrol and entice corporate and financial support. Mental images and projections of the user-consumers, and of their lives and behaviors dictate the feasibility of an idea and imbue it with credibility. Trials are a halfway house for proving and testing assumptions, and are thus an attractive proposition in high-cost, high-risk operations. Here, trialists serve as *consumers* of the technology.

Projections of user-consumers appear again in product development, featuring and balancing with technical constraints in the consideration of initial designs and specifications. They also figure in transactions between the firm and outside agencies and partners. As such, it may be suggested that user-consumers, as an abstraction, form a most significant part of the currency motivating and generating the entire constituency of technology development. They are the currency that flows through the networks of development. Trialists, as such, are the surrogates of actual user-consumers; more than abstract projections, they are viewed and valued as providers of a more tangible representation of the product, market, and use in situ.

THE CAMBRIDGE INTERACTIVE TELEVISION TRIAL

The Cambridge Interactive Television Trial was hailed at its launch in autumn 1994 as the most technically sophisticated interactive television trial to date, being able of conveying true video-on-demand (VoD)—the ability for users to call up digitized video material (advertisements, movies, educational material, etc.) The idea for the trial was originally proposed by a team of technical and managerial staff who were to become the core of an operating division of Acorn Computers Ltd.—Online Media (Om).

The system was comprised of an ensemble of state-of-art technologies, some of which were developed specially for the trial and others scavenged and resurrected from pre-existent Acorn projects. Most notable among these were the ARM processor that had considerably raised the profile of Acorn as serious player within the PC manufacturing industry.[3] The widely renowned ARM chip fueled much of the credibility and feasibility for an Acorn set top box (STB), particularly as it was already well suited to providing video feeds for television displays. Other Cambridge-based companies with strong historical links to Acorn, such as ATML and SG Research, provided the digital switching technology, the component that characterized the real technical sophistication and innovation potential of the Cambridge Trial. VoD's biggest obstacle is the lack of a network infrastructure that can handle the large amounts of data required by video. The Cambridge Trial utilized asynchronous transfer mode (ATM) switching, enabling a broadband system that would operate through a cable network.

Together, these companies, along with the local cable franchise holder—Cambridge Cable—formed the Cambridge Interactive Television Infrastructure Consortium (CITVIC). Anglia Television provided some content material, along with Acorn's software division. ITN was also an early content provider. ICL provided the video server technology, and Acorn Om provided the STB and the interface software, and generally coordinated the trial (Figure 1).

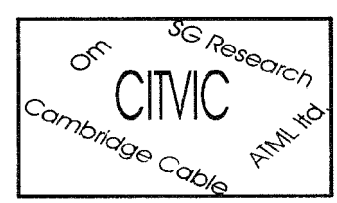

FIG. 1. The Cambridge Interactive Television Infrastructure Consortium (CITVIC).

TRIAL PHASES EMULATING STAGES OF INNOVATION–DIFFUSION

The original intention was that the trial would unfold over three successive phases or stages. Each step would be indicative of the stabilization of the technology and services as well as of their commercial appeal and viability. As such, trials follow models of development similar to those described Fleck (1988, 1992) as *innofusion*. Fleck (using examples drawn from robotics and corporate computer systems) suggested that the development and evolution of particular technologies and technological systems do not follow linear models of a discrete innovation phase (first), followed by (subsequent) diffusion into markets. He suggests a much more integrated model in which these two phases are often combine during implementation of technology. The argument is that as technologies diffuse into intended environments, they may highlight anomalies arising from the particular situations and circumstances of sales, consumption, and use.

An obvious example here is user-customization of artifacts. The user takes the produced artifact and enhances or embellishes it in such a way as to reflect the user's own image of its potentials. In the industrial context, Von Hippel (1986) has illustrated the potency of situated use, and of consumer-users to providing genuine insights to innovation trajectories.

Real, "lived" problems, events, processes, or occurrences often disrupt the clear lines drawn between innovation and diffusion. Johnson's notion of a cultural circuit, expanded upon by du Gay (1996) in their study of the Sony Walkman, suggests how products, within the processes of production to consumption, are given and yet also generate identities. Further, they are also subject to representation, and may suggest new regulatory structures. In the trial, unexpected developments in component technologies (drop or increase of costs, improved specifications, etc.), responses to evolving or changing client needs, responding to the evolving needs of consortium members, and observed and reported feedback from users in their experience of the situated use of a technology, process, or service are examples of influences that can drive policy and strategy revisions in the unfolding of a project.[4]

THE ANTICIPATED TRIAL AND THE ACTUAL TRIAL

The rollout to a full market version of the Cambridge Trial technology and content was to occur over a series of phases. Each phase was to be indicative of how the system as whole was developing—in terms of its growing robustness, reliability, and functional characteristics of the technology, as well as the sophistication and scope of the content. The anticipated phases were comprised of the following elements and features:

Phase 1. This was to be populated mainly with Om designers. Very much in the technology trial end of the spectrum, it practically represented a period of intense technological development and "tweaking" of the system components. Om designers as trialists on this phase meant that rapid development was possible.

Phase 2. The population here was a more heterogeneous array of personnel drawn from the members of the CITVIC consortium. Here, the performance of the delivery technology was expected to be largely stabilized, with attention shifting to matters of content provision, and the more "experiential" aspects of the system.

Phase 3. This would witness the first instances of the trial going public. The major issues to be addressed here were modes of payment and packaging of various service options, style and scope of content, and how often program would have to be refreshed. Success in this phase would lend credence to the mass-market potential of the Cambridge system.

The phases were to be indicative of the scale of participation in the trial, with each successive phase enrolling ever larger and heterogeneous populations. Phase 1, for instance, drew most participants from members of the design team, while phase 2 was drawn mainly from the CITVIC partners in the Trial. Phase 3 was the stage where the trial would first go public, drawing wider members of the local community in Cambridge. As such, phase 3 would serve as the testing ground upon which understanding of "real" situations of use would be gained. Trialists would serve as surrogate members of the general public, and as such, phase 3 would serve as the "launch pad" for the mass market, where system, content, and packaging would be finally tweaked (see Figure 2).

In this model, each successive system and content iteration would entail more targeted development, as the technology became more robust, the content became more satisfying and richer, and the market (and new ways of attaining market intelligence) became more fully established. As the trial developed, so the various types of user data would come into focus, dependent on the role of the user (moving the role as "user" to "consumer").

However, like many of the more technologically sophisticated trials, such as the ill-fated Time-Warner Orlando Trial, the actual unfolding of the Cambridge Trial suggested a quite different picture with respect to the planned unfolding. The development of broadband interactive television is not only technically sophisticated, as well as socially and organizationally complex—it is extremely expensive.

A major crisis arose for Om during the first phase of the trial. There came a point where the running of the trial was becoming a serious drain on the resources of the entire organization. This was of grave concern to some senior

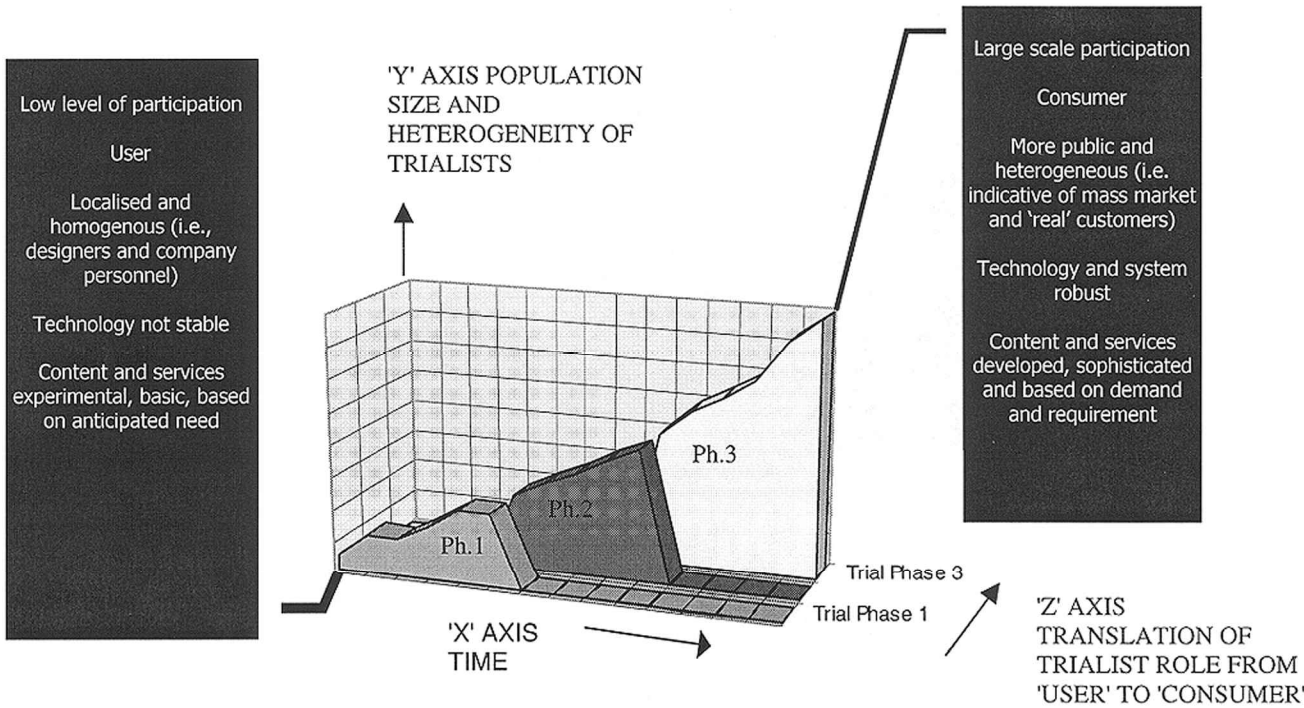

FIG. 2. Chart outlining the anticipated evolution of the trial. The 'x' axis represents time and the development of the sophistication of the content material. The 'y' axis, represents trialist population size and heterogeneity (i.e. phase one trialists were designers, phase three trialists would be drawn from members of the general public). The 'z' axis indicates the trial phases and the translation in trialist role moving from the role of 'user' to 'consumer.'

managers at Acorn Om. Recent developments in the field of digital networks were beginning to suggest alternative models for populating consumer homes with STBs. For instance, the Acorn Om 1995 business plan was based, not on ATM switched MPEG decoding interactive television, but on much less sophisticated systems that did not incorporate the features and functionalities for broadband services; the Lightspan Partnership, Inc., a producer of interactive instructional programming for elementary schools in the United States, had placed an order for several thousand units of Om's STB2 (the second-generation STB) with CD-ROM drives installed but without any kind of networking capability. Also, UK-based Viewcall Ltd., which was experimenting with an early form of "web" TV[5] technology in the United Kingdom, required STBs to provide a TV/modem/Internet style of service.

The success of STB technology outside the arena of broadband interactive television (i-Tv) gave rise to questions within Acorn Om regarding the strategic orientation of resources and development capacities. While the broadband model remained a long-term objective, it required significantly more investment of resource and capital than what had been anticipated. There was now a strong feeling emerging from some quarters within the firm that it would be better to pursue a different strategy exploring the more immediate, shorter term opportunities that were now appearing.

There were other problems within the trial. Implementation of phase 2 of the trial was severely hindered by lack of recruitment from within CITVIC, the technology partners. There was a marked lack of content material and services on the system to make it viable for phase 2 implementation. While the system had developed technically, and had reached a stage of being reasonably robust, it was realized that there was a desperate need for richer content and service provision. This was understood as being clearly outside the capabilities and competencies of CITVIC, and laid the foundations for drawing in other players who would take over responsibility for content. The trial publicity had already attracted interest from media and service-sector companies, and a plan was drawn up that was in essence geared to getting these parties involved. It offered a means by which the Cambridge Trial could be made economically and developmentally autonomous from the wider development activities of Acorn Om. This new group was involved through the *service nursery*—conceived essentially as a "safe learning environment"—where various principal service providers (PSPs) would learn something of the potentials, pitfalls, and technology involved in the new world of interactive television.

With Acorn Om as facilitator, the PSPs would learn how to use the technology and produce interactive television content material, how they could work together and form alliances, and how they would approach and make sense of

user-consumers. Economically, they would become stakeholders in the trial, with responsibility for producing content relevant to their business. Shifting the responsibility of content production to the PSPs would solve the problem of content on the trial for CITVIC, with the additional benefit of developing a revenue stream for Acorn, who would sell them consultancy and authoring technology. Acorn Om were now of the view that as the trial grew, and the amount of PSPs increased, it would eventually return to its preferred role as a technology developer/producer. It would make money from the deployment and development of systems worldwide.

USER RESEARCH AND THE WIDER CONSTITUENCY

This new development in the unfolding of the trial, while logical, represented a major undertaking in terms of social learning, and organizational and group dynamics. For instance, the service nursery demanded its own interorganizational management infrastructure, as well as its own working methods. It gave rise to a number of working subgroups set up to look at specialized issues, such as legislation and copyright, interface, transactions, and system architecture, drawn from the PSP staff who were responsible, expert, or deemed most appropriate for the area. These groups were originally to be facilitated and chaired by Om, as well as overseen and reporting to a service nursery management board.

My initial involvement with the Cambridge Trial was to conduct usability studies of its interface and remote control technology. This evolved into a more general perspective looking at wider issues relating to research of content material. I was invited to join the user research/marketing working group. The chief objective of this particular group was:

> looking at the plan for sending questionnaires and conducting user interviews.... The intention would be for this working group to define a number of questionnaires and points at which users are contacted and to ensure that this is coordinated so as not to overload them with too many interviews and questionnaires. (Cambridge Trial project manager)

Such a relatively succinct aim, however, appeared to be much more easy to articulate than to operationalize. While it remains outside of this relatively short article to catalogue these in depth, I nevertheless attempt a short summary of why this was.

Poor Coordination Between Groups and Between Individual and Collective Group Needs

Fundamentally, the only player that possessed anything like the "big picture" of the entire constituency of the Cambridge Trial was Acorn Om. However, Om's active role within the service nursery was contrived. It presented itself as merely a stakeholder (i.e., only as the technology provider) within the trial, rather than its more fundamental role an overall facilitator and gatekeeper of the system's technical potentials. It disassociated itself from a responsibility to proactively maintain any major governing, managerial, or constituency building role. This stifled development and confused the overall governance of the project at this level, leading to the breakdown of coordination between the various levels of management of the trial, as well as between individual group members. For instance, within the user-research group, there was no one place or contact where one could appropriate minutes of meetings, nor where one could locate group directives or trial information (such as recruitment levels).

Different Motivations and Levels of Interest of PSPs

Some members had multiple commitments and roles regarding their participation on the trial. For instance, Om had one role in that they it was a member of the group interested in usability issues with respect to the development of the technology and interface. However, as mentioned under the previous heading, it also was arbitrator and, to a large extent, gatekeeper of what could and could not be done through the system. It would conduct development work and sell consultancy to other service nursery members. It was also the developer of the system-log analysis programs as well as the front line of recruitment for the trial. Another member, a private-sector social research agency, had a primary objective that was to conduct feasibility testing of online market research questionnaires. The agency also viewed itself as the obvious choice to lead the group through its expertise in conducting marking research. It would implement the research regarding the evaluation of the trial itself, on behalf of and under the direction of the group. Both Om and the social research organization were involved with recruitment. Above and beyond the obvious distinctions of these two particular group members, each organization had different questions and inertias with respect to the trial. It appeared that the group was an ineffective vessel for resolving conflicts of interests between members in their organizational and individual perspectives of the joint research program. Simply, each member organization and each of their representatives had quite different visions regarding the importance of the trial in their future business, and their need for user-consumer research. Consensus on the research approach and nature of the questions was difficult to achieve.

Differing Expertise Between Group Members

Members of the group were not necessarily involved directly with market or consumer research for their respective

firms. Some were planners, others software producers, project managers, and so on. Members of the group who represented the different industry sectors each came from a culture where public are conceived of as viewers, consumers, customers, and/or subjects. Each had different routines or ways of approaching people and conducting research. An obvious example can be drawn between the attitude of the bank PSP, with its "revered" customers (and its culture that places emphasis on customer care), and that of the social research agency with its attitude to people as information providers. Similarly, some organizations prioritised quantitative methods over qualitative approaches, and so forth.

Failure to Raise Trial Recruitment

The Cambridge Trial was plagued with recruitment problems from phase 2 of the trial. Originally, there were to be 100 homes in phase 2, drawn from members of the consortium of firms that made up CITVIC. The trial failed to attract participants and so embarked on a "schools recruitment" policy (possibly derived from business with Lightspan). This was basically comprised of installing authoring technology in a school with the intention of recruiting parents eager to get a "window" on their child's schoolwork. This had an additional benefit. One of the original schools targeted was in a convenient area for connection. However, due to technical and financial problems, they never reached the level of recruitment anticipated (in the end only about 70 homes were connected).

Failure to Produce Rich and Varied Content

Content had to be developed and authored on proprietary Acorn technology and software. This dramatically reduced the ability for content and service providers to produce material for the system. This has been cited as a main reason that the project failed to enrich its content provision. With little change in content, there was an obvious fall-off in user access times, and this quite obviously devalued user-generated data—a primary reason for having a trial in the first place. For a large part, content starvation rendered impotent both the system-log data (which had taken some development work to produce) and attempts to conduct more in-depth qualitative approaches to uncovering user perceptions of the system. No stimulus, no response.

I would suggest here that much of the root of these problems were due to a recurrent failure in how firms conceive of user research relative to the wider constituencies of development. For instance, among others, Norman (1993) identified such problems at Apple with respect to effecting HCI strategies in product design: "10% of the problem involves the science and engineering knowledge of HCI, 90% reflects the social and managerial side. The real problem is one of attitude, which then gets reflected into organizational practice." Considerations of the particular problem of siting and scaling user research relative to product and organizational development in trials have motivated recent exploratory work we are currently developing at Edinburgh (i.e., Molina & Nicoll, 1996). Building on Molina's (i.e., 1990, 1992, 1994) constituency-building framework, and my own work on the contextual usability of products[6] (Nicoll, 1994), there is the suggestion that the product of user research may be optimized by being mapped against the wider complex of motivations and interests that draw players together in cooperative projects. User-consumer research within its more naturalistic setting needs to be reconceptualized not only as a research site (i.e., an attempt to show "real" or "lived" uses through the employment of ethnographic methodologies), but also as a fully integrated part of the overall development of the sociotechnical constituency involved (comprised of those individuals and groups who would derive the most benefit, and who would be most proactive with the knowledge).

Pragmatically, such an understanding can guide the scale and scope of user research most relevant to the state of development of these constituencies, with benefits such as promoting a more "ecological" implementation process, one that is more effective and in which design is better geared toward emergent user requirements. The underlying objective is, of course, bridging the cultures of production with the cultures of use.

CONCLUSION: CONTEXTS AND ORGANIZATION OF TRIAL USER-CONSUMER RESEARCH

A significant reason for conducting trials is the elicitation of user responses as well as examining how this relates (or perhaps *should* relate) to other elements shaping the technology and business—such as demonstrating competencies, and developing and managing partnerships. This research suggests that mapping constituencies is a useful way to track the unfolding of events and developments and evaluate their implications upon implementation of strategy. Within the Cambridge Trial we show how certain social and technical elements began to prevent and convolute the development and implementation of the user research process. Though the stated objectives of the working group on user research show some prior awareness of the logistical problems of conducting such research, in practice, useful and informative results about use proved difficult to achieve, due to the way in which the constituency concerned was built and managed.

For trials to be effective, they have to be recognized as distinctive constituency-building processes that include how the technology develops, how users are enrolled, and

what can be expected from them. From a strategic perspective, the more closely anticipations match actualization, the more successful and controlled development will be. The role of research and experiment is precisely to explore this tension between anticipation and actualization. However, the Cambridge Trial stands as testament to the many changing contingencies that fashion the course of a project and its directions. Most importantly, it shows how poor governance of trials can increase the tension between anticipation and actualization, almost to the point of failure. Given the problems that may arise in the management and evaluation of trials, it is important to adopt a pragmatic approach to the conduct of user research programs geared toward the particular circumstances and state of the technology. This can aim toward more "ecological" (in the sense of more effective and appropriate for the parties involved) product and service development. It is therefore necessary to elicit the needs and requirements of the constituent organizations involved in the trial, as much as the needs and requirements of user-consumers. Only then can trials integrate user research as part of the more generalized and macro-level influences shaping sociocultural, business, and technical development.

NOTES

1. Carey (1996) and Carey and O'Hara (1995) outlined instances of early forms of interactive television that used paraphernalia in order to allow children to "interact" with the television screen. However, as far back as Baird, there is evidence of "two-way" TV, as he sent a two-way signal between Glasgow and London in the late 1920s.

2. Alternative systems may utilize these communications systems as a sole mean to providing interactivity, or they may use some form of combination (i.e. satellite broadcasting *and* the telephone network).

3. In 1985 Acorn began research on a new processor architecture, the ARM chip, which formed the heart of products from 1987. The success and high profile of the chip led to the flotation of Advanced RISC Machines (ARM) Ltd. ARM was formed in November 1990, as a joint collaboration by the Acorn Computer Group, Apple Computer, and VLSI Technology.

4. Examples of the issues that may arise include problems due to the features and functionalities of the technology not matching performance specifications, and requiring further development work; the fact that an updated component, that it was desirable to incorporate, had become available during the implementation of the technology (such as an improved and more reliable video card for a STB); and changes in the organizational rules and routines that imply changes to the original product specification (such as developing censorship software preventing the transmission of pornography to schools-based networks).

5. It is interesting to note that Viewcall's approach preempts more recent attempts by others, namely, Oracle Corporation and WebTV Networks, Inc., to promote domestically based online information to homes via STBs and televisions.

6. Here the usability of technology is conceived as a contextualized and interdependent element within the complex of influences that act as the mechanism of domestication processes and consumer acceptance. These include *usefulness*, [the development of] *usage* patterns, and the particular social and cognitive exigencies of situated *use*. These experiential and behavioral elements are considered under the rubric of *contextual usability* (CU).

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