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The Managed Prosumer

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The managed prosumer: Evolving knowledge strategies in the design of information infrastructures

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Abstract

This paper contributes to the reworking of the traditional concepts and methods of Science and Technology Studies that is necessary in order to analyse the development and use of social media and other emerging information infrastructures (IIs). Through long-term studies of the development of two contrasting IIs, the paper examines the *prosumer management strategies* by which vendors manage their relationships with their diverse users. Despite the sharp differences between our cases - an online-game with social network features and traditional enterprise systems – we find striking homologies in the ways vendors manage the tensions underpinning the design and development of mass-market products. Thus their *knowledge infrastructures* - the set of tools and instruments through which vendors maintain an adequate understanding of their multiple users - change in the face of competing exigencies. Market expansion may favour 'efficient' quantitative user assessment methods and the construction of abstract *user categories* for designing new generic solutions and services around market segments. However where a product *extends* into new and unfamiliar user markets the growing *social distance* between developer and user may call for 'richer' direct ways of knowing the user. We note the emergence of collective fora, which can provide a space for independent action and innovation by users. However, these were managed communities. Certain user relations functions were pushed out to the community or 3rd party organisations and at other times pulled back in-house - for example to increase vendor direct control. This picture is far removed from the visions of seamless integration of producers and users encouraged by notions such as prosumer.

1.   Introduction

The conception of social media and the Internet as generative platforms (Zittrain 2006), designed to enable the highest variety of possible uses, is accompanied by somewhat Utopian expectations. These new technologies will somehow escape the difficulties and disappointments that were encountered with previous generations of Information and Communications Technology (ICT). As well as being flexible in their development and use, online links would overcome the gulf between supplier and user. The distinction between producer and user is seen as an outmoded reflection of earlier systems of production/distribution; 'prosumers' and 'produsage' become the norm (Toffler 1980, Bruns 2008). The multiplicity of individual users and their differing requirements would be well understood: through their role as developers, through their direct communications with developers and through the analysis of escalating volumes of information about individual users and their preferences expressed directly through the network and revealed through their engagement with systems (Howe 2008, Shirky 2006). In this way customised services would be fluidly developed and delivered online. The rhetoric suggests that firms have already established these kinds of service development model (Anderson 2006, Tapscott & Williams 2006). But what, as a point of fact, do we know about how they engage with their growing array of customers? How do they gain an adequate understanding of their users? How do they manage their relationship with their increasingly large and diverse user-base?

We explore the unfolding of these new kinds of engagement in two sharply contrasting cases: *a social game and online community* with free membership which has attracted a worldwide user base of millions of young people and a more traditional type of ICT application: *enterprise systems* - complex and expensive software products used by many large private and public sector bodies to support the wide range of organisational functions. Using such two extreme cases for paired comparison has been made possible by exploiting the results from our extended programmes of investigation, separately conducted, albeit within a convergent interest in the *Biography of Artefacts and Practices (BoA)* (Pollock and Williams 2009, Hyysalo 2010).

In both of these cases we note the shift from direct to indirect modes of knowing the user, as suppliers resort to different ways of acquiring knowledge from and about the

user, when direct supplier-to-customer contact is not attainable or economically viable due to the growing size of the user base. There are also occasions where suppliers are forced to resort to more direct forms of engagement when the fluidity of the market undermines the alignment between past and current/new users and challenges their historical knowledge base. Suppliers have put into place particular combinations of community engagement, tools and instruments (which we characterise as 'knowledge infrastructures') to ensure they have an adequate understanding of their multiple users in a cost effective manner. In contrast to the utopian images of open and pluralist interaction between producer and user, we find suppliers struggling to manage their user relations. And as we shall see, they need to develop and adapt strategies for managing their customer relations over extended periods and across all the moments of the product lifecycle, encompassing design, implementation, customer support, and further development. This observation underpins the need for a biographical perspective which, rather than simply addressing particular moments/locales of technology development or implementation or use, extends the timeframe and scope of analysis and explores the evolution of these arrangements as these information systems/infrastructures over time (Williams and Pollock 2012).[i]

Pollock & Williams (proposing the Biography of Artifacts BoA framework), as well as Hyysalo (extending this to the Biographies of Technologies and Practices), propose a biographic turn in the social study of information systems. This derives from a concern to reassemble the macro and micro levels of analysis. The biographic method, as it has been used in different branches of social sciences, represents a way to clarify the connections between the individual and the socio-historical in reaction against the flat ontologies of postmodernism. In social studies of information systems, by tracking the movement of entities (artefacts, practices etc) across organisational boundaries, rather than limiting enquiry to particular moments and sites (for example of technology development or use) BoA helps identify new spaces, sets of relationships and classes of actors that together constitute particular technological fields and help to form a sufficiently rich (set of) observational units to characterize Information Systems as an extended field of practice.

2.   Tensions in user involvement

Science and Technology Studies (STS) has, from its earliest inception, been concerned with materiality (Leonardi et al. 2012) and thus with the design of new technology; design must embed a representation of potential users, their needs, purposes and contexts. However developers operate under circumstances of incomplete understanding of the user: user requirements cannot simply be 'read-off' by the engineer, but evolve in response to changing expectations of technology, technology affordances, user practices and concerns (Mackay et al. 2000). As their prior personal experience/presumptions (what Akrich [1995] calls the i-methodology) and knowledge based on earlier products/practices may no longer be applicable for novel products, engineers must draw upon various different kinds of information and experience with uneven validity (Williams, Stewart and Slack 2005). When developing systems for multiple users, some have warned that the wide range of specific user requirements needs and concerns may overlooked in favour of generalised views ("design for everybody": Woolgar 1991, Oudshoorn, Rommes and Stienstra 2004).

These observations are particularly pertinent in relation to information infrastructures (IIs). Hanseth, Monteiro and Hatling (1996) draw attention to the emergence of these interconnected collections of computer networks whose heterogeneity, size, and complexity will extend beyond those that exist today - which demonstrate some different features to the discrete computer systems that had hitherto been the focus of attention. IIs thus conceived are large-scale, complex, enduring, integrated, interconnected, and invisible until breakdown (Bowker and Star 1999). For this paper we are concerned with their *openness to a large number and wide range of users* with heterogeneous purposes, agendas, strategies and how they are *stretched across space and time* - shaped and used at many different locales and enduring over long periods (Monteiro, Pollock, Hanseth & Williams 2012).

The traditional narrative of STS, articulated in reaction against the modernist vision of technology solutions that could somehow anticipate and cater for current and future users/uses, highlight the difficulty, indeed implausibility, of designing artefacts that cater for an increasingly large and diverse array of users and uses. This account seems to lag behind emerging industrial practice. Successful providers have developed highly elaborate arrangements to understand their expanding user base and to manage their relationships with users in product development (Postigo 2003). This gap in practice and research is to some

extent methodological. Traditional STS research on users has resorted to studying discrete moments of innovation – for example of developing particular product releases. Such a snap-shot focus occludes the strategies that companies and users develop over time and beyond singular application releases. This paper arises from an effort to rework micro-sociological frameworks and methodologies to address these longer term distributed processes.

This paper focuses upon tensions in user involvement in relation to increasingly globalized information infrastructures that are common to social media as well as more traditional software solutions. We have chosen empirical examples at the opposite ends of the spectrum in terms of the character of the application and the provider's business relationships with their users. To pre-empt some our core findings: despite these differences, we identify significant homologous practices and challenges. We explore the complex strategies that these providers adopted in order to manage their relationship with their array of customers. In both cases the firms needed to develop an effective understanding of their user base whilst at the same time finding ways of economizing on learning about all of their particular users. The latter required them to put boundaries around and internally segment their current and prospective market.

Our previous study (Pollock and Williams 2009) showed how the creation of necessarily generic (enterprise) solutions involved a careful process of aligning, sifting and sorting the enormous array of potential user requirements, in which particular users attracted different priority depending on their perceived strategic importance for the provider. Equally, Johnson and Hyysalo (2012) have shown how the social media provider also sorted and classified their customers according to their generic characteristics and their fit with the provider's business model.

In the case of Habbo the social media service was initially developed by technical specialists to play amongst themselves and with their friends. As we see below, as Habbo became taken up by large numbers of users with very different demographics - children and teenagers – the developers recognised that a social distance had emerged between themselves and their user base, such that they could no longer rely upon their personal experiences. The firm was therefore forced to deploy a portfolio of mechanisms through which users could be apprehended – including resort to increasingly large-scale

methodologies (shifting from direct contact through interviewing/observing uses to larger scale surveys and the use of data analytics). A parallel social distance has been noted in enterprise systems development when early 'pilot' users in the higher education sector experienced a loss of control as the system became geared to a wider community of users (Pollock, Williams and Procter 2003).

We will now explore these through our two detailed case studies. But first we describe the methodologies by which we developed these cases.

3.   Methodology

Though conducted independently, both these studies were united by a shared analytical concern to understand the biography of artefacts (Pollock and Williams 2009) and practices (Hyysalo 2010). Instead of the traditionally-favoured or expedient research design involving 'snapshot' studies of particular moments and sites of technology design or implementation or use, this proposes a methodology that will encompass the longer-term evolution of developer-user inter-relations and across multiple locales, each of which is researched in in-depth qualitative detail (Williams and Pollock 2012).

In the current paper we compare the analyses of biographies of two contrasting software products as they move across organisations, from one national context to another, and from a small to a larger user base. The selected packages (an Enterprise System [ES] software package and a Social Media service [SM]) both cover the early to mid maturity stages in their biography in a specific market. Our rich combination of data collection methods enabled cross-case comparisons of the development of the provider and its user base. Our overarching methodology and research design, developed in accordance with the Biography of Artefacts & Practices perspective (Pollock & Williams 2009, Hyysalo 2010), involved ethnographic research, observation and interviews, supplemented by analysis of online interactions. We chose our sites in order to create a contrasting comparison between supposedly distant software products (Enterprise Systems and Social Media services). We wanted to reveal the extent to which a biography approach was able to revisit the now well-rehearsed account of Social Media services as something new and different from traditional software products (such as ES). The contrast between SM and ES cases would seem to offer 'maximum variation' thereby highlighting the consequences of their very different circumstances on both process and outcomes (Flick, 1998; Rihoux, 2006).

We did this by examining interesting linkages that current-day social media services share with more traditional software systems, in terms of the strategies by which both firms manage user relations over time. We have been able to trace (some aspects of) the complicated user-developer nexus. In the following section we provide a brief review of the development of the provider and its user base in the cases of social media and enterprise systems. We then move on to examine the strategies in each case by which the vendor manages its relationship with its users. The analyses then discuss homologies between these cases before going on to draw some brief conclusions

3.1 The development of the provider and its user base

a) Social media

Habbo Hotel is one of the oldest and most popular social media services in which children and teenagers meet, socialise, and play many types of games. Between 2003 and 2010 the service expanded from 4 localised hotels and 1 million monthly users to 11 language versions with 15 million monthly users from over 150 countries. Instead of an entrance or a monthly fee, the business model is free-to-play—revenue is based on micropayments and advertising in the hotel. In the early design of Habbo traditional pre-set game formats were avoided and instead players, called Habbos, are encouraged to create their own objectives alongside chatting, room decoration, and meeting friends. According to the developer company, *Sulake*, most of the teenage players log on after school; on average they spend around forty-five minutes per day in the hotel or on its related discussion forums.

Our data was gathered both from developers and users through a multi-method approach with varying intensity over eight years (during 2003–2010) and has been reported in detail in a PhD thesis (Johnson 2013). The research started in the fall of 2003 with pilot interviews and participant observation in Habbo user communities. During 2004 the focus was on visitor profiles, studied through a survey that reached 10, 000 users, and online texts written by Habbo users on websites, blogs and in discussion forums—so called Habbo fansites to understand the consumption in Habbo. In 2005, ten theme interviews with Habbo developers and three focus group interviews with twelve Habbo users were organised. In 2006 one of the authors participated in the development of customer feedback methods at Sulake. From 2007 the research has concentrated on analysis, trying out new

features in Habbo and keeping up-to-date through additional interviews with Sulake developers.

The data analysis proceeded in multiple waves over the years. A survey provided quantitative information on the use of Habbo. Analysis of texts written by Habbo users on fansites explored different Habbo consumption styles, popular activities, and hotel history. The topics of the user interviews were their participation histories, changing motivations, and meanings given to membership and reference groups in Habbo. Taken together, these bodies of data provide us with an excellent view of the varying forms of interchange and dialogue between the users and developers of this social media service. This case is representative beyond its target group and games to social media in general because of similarities in software business, group communication functionality, and active user communities. (Johnson & Hyysalo 2012, Johnson, 2013.)

What Sulake–Habbo consists of has changed significantly over the years. Habbo started as a pet project for a few developers and their friends, grew to become a popular online world among new media people and within a few years became mainstream for a teenage target group. Technical, economical, and organisational bottlenecks were solved so that the service could grow and scale up to become a transnational service. We group the service evolution into five stages (Table 1).

Stage	Years	Monthly Users	Hotels
Concept	1999–2000	< 10 000	1
Beta	2001–2003	< 1 million	4
Expansion	2004–2005	1–5 millions	16
Complexity	2006–2007	5–10 millions	19
Competition	2008–2010	10–15 millions	12–18

Table 1. Habbo Service Evolution

Concept refers to the first prototypes in 1999 and 2000: Mobiles Disco, Lumisota, and Hotelli Kultakala. At this time, the development resources were minimal as the two founding developers created the first prototypes in their free time after work and during weekends. Beta refers to the period between 2001 and 2003, when much of the basic functionality was completed. Internationalisation started through a UK partnership, followed by a Swiss partnership. Expansion (2004–2005) is when the product was packaged so that

roll out was possible in more than 10 new countries during one year (previously different code was used in different countries). Complexity refers the extension of the product to a social networking service, from 2006. Competition describes a period in which social media services for children and teenage adoption of Facebook increased. The data is reported in more depth in Johnson (2013).

b) Enterprise systems

The case of enterprise systems (ES) is based on a long-term research project where we have been able to assemble a comprehensive and in-depth picture of the evolution of particular enterprise-wide solutions for the greater part of their lifecycle, from their earliest stages of conception to their current adoption and projections of future developments. We have had unique access to several software providers, including two leading global software giants, and a number of user organisations and user fora. Importantly, we have been able to view the work of ES vendors from a number of distinctive viewpoints. First, this was from 'inside', where we observed how they managed their packages as well as the users attached to them at one particular point in their lifecycle (the development of the early Beta versions of the product). Second, again from the inside, we witnessed how ES vendors interfaced with various sets of users during the development of a set of products (a CRM module for the Higher Education Sector, a more advanced cloud-based version of the software). Third, we continued to study this particular ERP module along a number of different phases in its lifecycle, from inception through to 'maturity'. Fourth, we also studied the module at the supplier–user nexus through long-term participation in a particular user-group, where we observed the user community attached to the module and wider ERP system. We can thus claim to have a comprehensive knowledge of ES development (having followed its career across different sites for nearly a decade now). Our data are reported in more detail in various papers, PhD thesis and books including (Pollock & Williams 2009, Campagnolo 2013, Mozaffar forthcoming).

Observed from the vantage point of leader software giants, the career of developer-user relations in ES can be summarized as follows. Suppliers of enterprise-wide systems started to release packaged software solutions in the early 1980s starting with particular enterprise functions (e.g. stock control, accounting or finance) and extending to other areas. During those days, users from various organizations met informally to discuss their issues

around software products. Then as ERP products were more widely used, suppliers formed 'user groups' to create a unique point of interaction with its wider user base. Some vendors sought to control these user groups to forestall the growth and influence of widespread informal groupings. In other cases, including the main case reported here, the user group adopted a membership model and became an independent non-for profit organization, which was run and organized by user volunteers. Table 2 shows how we summarise the evolution of enterprise systems over time.

Stage	Years	Description
Inception	1970–1980	Single function applications, strategic planning for integration
Identification	1980–1990	Extend to all organizational functions, identification of 'selected' users needs
Generification	1990–2000	Enterprise wide systems to meet generic needs of user organizations, development of configurable templates
Segmentation	2000–2009	Develop sector-specific modules

Table 2. Enterprise Systems Evolution

4. Strategies by which firms manage user relationships in Social Media

4.1) Strategy Changes Due to Shifts in Developer—User Social Distance

As this service evolved we see changes in what was designed and developed. The concept stage started with making Habbo a 'cool' space to hangout online; the developers were building the service for themselves, their friends and their new media colleagues. Developers

had easy access to users in the Finnish user community as they could log on to Habbo and check what was going on. While the developers also used the service themselves, their informal engagement with the user community gave them a rich implicit understanding of the users. Various informal evaluation practices, such as the slogans "easy access, easy play" and "where else" which had a shared meaning among the developers, guided the design early on. During the first year developers received abundant e-mail feedback from users, which became a handy reservoir for design inspiration for the developers, who used to return to it periodically to browse for good ideas.

During the beta stage, designers focused on typical usages and the changing target group. With too many users to keep track of, the developers turned to typical usages: logging in, learning to navigate in Habbo, connecting with others, creating a room etc. As the user base extended to a younger demographic, an age gap emerged, which had fundamental consequences to the service. Means for safe playing were implemented and the parent of the user became a key stakeholder in website communication. The fading insider perspective necessitated market and user studies to understand the new target group and a typology to communicate with it. A back-end service that kept track of furniture sales across hotels was developed, allowing a comparison of Habbo features on the basis of their economic performance, as well as their functional or aesthetic properties. Emerging fansite discussion forums provided an additional important source for design inspiration. These various means of learning about users were used to compare user the base in different hotel countries.

As the monthly number of users approached 1 million in four different countries, hotel-specific country organisations emerged as intermediaries between end-users, volunteers, and the centralised game development. These country offices would take care of the local technical configuration of the hotel, community management, customer support, local campaigns, and advertising.

4.2 Active Users and Emergent Developer Strategies

A key factor for service success in the early stages of its lifecycle was the emergence and continuous management of the fansites and volunteers programme. From the start of the service, groups of active Habbo users teamed up and created Habbo-themed websites in the form of blogs, online magazines, or discussion fora. These fansites emerged around all Habbo Hotels in their respective countries or language regions. They varied in size and

temporality, from small sites with a few web pages that operated for a few weeks to the biggest fansites with hundreds of thousands of page views, readers in more than one country and that operated for many years. While most fansites remained fairly underground phenomena, the more popular ones got recognized by Sulake as "Official Habbo Fansites". This programme of giving special status in the community to certain fansites started after the first three years of the service, during which the developers had operated their own official online fanzine, which also served as a model for later user-produced fansites.

The Habbo fansites served important community-building purposes, as they were run by active users and subgroups formed around them. For instance, they complemented the official website, strengthened the governance policies of the producer, reproduced and reinforced social positions (like potential Habbo career paths or legitimized user groups), and improved the Habbo users' awareness of the fan cultures around Habbo. Since Sulake developers had a wide variety of means to learn about the users, in which what users wrote on fansites played an important role, qualitative field studies and user interviews could be used, not as the main way to understand use practices as commonly suggested (in user-centred design), but in a complementary role, when the otherwise available information was conflicting or missing.

For the first five years of Habbo, Sulake relied on volunteers to moderate the online activities. Volunteers were called "Hobba" and their function was to mediate in conflicts, send warnings to misbehaving users, kick them out of the hotel rooms, or ban them from the hotel. To share experiences and moderation policies, the volunteers created an online forum for themselves. Alongside internationalisation and more organised volunteer management, Sulake started hosting a local volunteer forum for each hotel country. The volunteers rapidly achieved an important role as mediators of user opinions: the developers knew that as the volunteers spent the most time in the hotel, they were always the first to know about the current user concerns, wishes and emergent activities.

During the expansion stage, many development practices became more formal and cost-efficiency became more important. As the organic beta testing phase changed into a more controlled release management process, Sulake started piloting new releases for one month in one hotel country, before diffusing the release to other hotel countries. Playability testing was undertaken to assess various playability aspects, such as gameplay, game

mechanics, appearance, sound, and social playability. During 2004–2005, focus groups were conducted to evaluate the applicability of Habbo pixel style graphics and use of colours for the Asian market. The target group of the first usability evaluation was new users and business critical service features.

As some hotel communities grew larger, pressure emerged for customer service to automate their responses. For instance, in a country with several hundreds of thousands of users, a new feature might spawn several thousands of inquiries per day. In 2005, a new customer relationship management system was introduced. It featured a set of standard questions and responses, which reportedly reduced inquiries by 90 percent. In 2005–2006 Sulake brought the moderating function in-house, by employing moderators in their country offices. The volunteer program changed, and experienced Habbo users could apply to become so called Habbo eXperts, who did not have moderating powers anymore, but could get into a room that was otherwise full.

4.3 Cumulative and Strategic User Representations

In the complexity phase, many ways of understanding the diversity of the users were developed. In an effort to gather systematic feedback before the implementation of new features, Sulake recruited 200 volunteers in one country to form an online panel. Market research surveyed users' lifestyles, favourite brands and media usage patterns across different countries. User and group homepages and dynamic indexing systems (e.g. tags) served both communication between users and the developers' interest in learning about the users. In 2008 the volunteer program changed again, and eXperts became Habbo Guides, who volunteered to welcome new users and explain Habbo's features. In 2009, Guide "Bots" were introduced, answering basic questions about Habbo.[ii]

In the competition stage, global competition and multi-sided business grew in importance. In 2009, a new approach to characterising the user base was introduced based on data driven *personas*. Sulake's methodology sought to ensure that persona descriptions would reflect growing and declining market areas as well as have an even gender and age spread. The idea was that developers would have an updated reference to the goals and needs of Habbo users at hand, which could inform design solutions and evaluations. The process of learning from surveys had been significantly developed with the aid of automation and web analytic techniques. With this overview of the evolving knowledge

strategies of the social media case, we now turn to examine the strategies in the enterprise systems case.

5. Strategies by which firms manage user relationships in Enterprise Systems

5.1 Changing Vendor Strategies over the Product Lifecycle

Enterprise wide applications are widely adopted by large organizations. It has been argued that the close link between vendor and user in traditional 'bespoke' IS systems has been replaced by an arms-length relationships as these systems have come to be supplied as generic packages (Sawyer 2001). Though these may originate as bespoke solutions, suppliers need to avoid their products being tied to the requirements and practices of particular user organizations and thus not widely marketable (Pollock 2005). Successful vendors of packaged solutions have learnt to organise and segment their user base and orchestrate a range of different types of links with actual and potential users in order to develop, supply, implement and support generic solutions. While the majority of links over the lifecycle of the generic applications are controlled by the vendor, there are also some types of relationships which are predominantly organized by the users.

The initial type of link that we observed during early stages of product design (dubbed 'identification phase' in Table 2) involved one-to-one relationships that the vendor formed with some customers. In the early phases of design, as the vendor aimed to identify the core requirements of different customers in the market, they performed field studies on a range of pilot sites. In these sessions the vendor visited pilot customer sites and conducted interviews, surveys and inter-organizational focus groups, also known as 'wants and need sessions' within these organizations. The pilot sites were selected on the basis of the vendor's strategies with three main reasons being highlighted as most important: 1) the customer's market sector, 2) the reputation and status of the customer company and 3) 'willingness to participate' in design and development of ERP products. In these sessions, in which individual user organizations were studied by the vendor, participants were asked to explain their requirements for the system. Findings from these early encounters with these 'selected' customers were examined to discover the core needs of users. The outputs from

various user organizations were then compared and a 'value' was defined based on their recurrence. The 'high value' needs are said to form the cornerstone of the product.

During the identification phase (see Table 2), another type of relationship was what one vendor termed the User Experience Ethnographic Study. The vendor observed the day-to-day activities of individuals working within a user organization. The aim was to extract the detailed functions involved in performing tasks. The various types of field studies (e.g. pilot sites and ethnographic studies) conducted by the vendor entail careful extraction of individual organizations' needs (the identification stage) and form a basis for locating the generic requirements.

During the generification phase, vendors operate an active search for similarities between user sites. Vendors encourage users to align their requirements with others at a user meeting to increase the likelihood that their adaptation requests will be addressed. Following the identification phase, a wide number of potential users were therefore invited to meetings held at the vendor's headquarters. The reported functions of these users' meetings were to receive feedback on beta versions of the software and to continue the requirements gathering process. Participants were asked to spell out how their particular requirements differed from the prototype or from the view being articulated by other participants, while the supplier observed the similarities and differences between institutions (and begins to shape them, Pollock, Williams & D'Adderio 2007).

Through spending time getting to know the size and complexity of the task at hand, after these meetings users appeared far more accommodating to demonstrate that their requirements are 'generic' and not 'particular', therefore themselves searching for similarities between their own and other sites (Pollock & Cornford 2004).

Furthermore, generic software development entailed careful segmentation of the user base according to the strategic importance of the customer (including its role as a pilot site). Vendor organizations thus distinguished between strategic, consultative and transactional customers, according to users propensity to engage with the future development of the technology (Pollock, Williams & D'Adderio 2007).

An important aspect of this *segmentation* phase was designing the software architecture in such a way to match and retain user segmentations. Software packages are designed around a basic organizational functionality, which is sometimes described as the 'generic

kernel'. The idea is to paint the organizational reality of adopters onto this kernel by developing numerous 'templates', which users can then select and tailor to meet their local conditions. The scope to change the surface attributes of the system (the 'template' to match user needs) together with a more stable inner component (the 'generic kernel'), provides a number of possible variations in the way the system is made available to the users.

Discrepancies between the 'vendor realized' user requirements and 'real' user requirements are said to be a major contributor to software failures (Davis & Venkatesh 2004). Indeed, subsequent to meetings held for the purposes of 'requirement identification' and 'generification' the vendor entered yet another type of relationship with the user.

Among the interactions were the usability feedback sessions, which we observed for three years during the development of a new ERP package recently released by one of the vendors. Unlike the previous type of interaction in which the vendor entered a long-term relationship with a limited number of user organization, the usability feedback sessions were an open call for all customers to attend two-hour sessions (i.e. very short-term engagements) without either of the parties entering into a long-term commitment. The functions of these meetings were to receive user inputs on detailed task flows, the pain points, and to diagnose and fix potential usability problems in early prototypes. In the earlier years of the product development the discussions were mainly formed around identification of unnoticed but definite needs. In other words, in former stages, 'generalizability' of the system was tested, while in the latter, the 'usability' of 'the generic' was being tested.

In such interactions the influence of user organizations on the core functionality are very limited, almost none. However findings from these interactions may lead to extraction of new 'generic need' at 'detailed functionality level', which has not been covered at earlier stages of the product development.

5.2   Active Users Force Extension of Vendor Relationship Strategies

In the following section, we want to focus on one particular type of user-developer link that exists in all different stages of the product lifecycle (Table 2). The 'software user group' are one of the most important coupling mechanisms between IT vendors and their customers. Some scholars go as far as to suggest that the user groups are the 'invisible arm of software producers' and that many IT vendors could not continue without their support (von Hippel 2005). Our observations of the various types of links between the users and

vendors highlighted the vital role of such groups as a medium between the suppliers of large organization technologies and their wider audience. Our study of the Oracle UK User Group (UKOUG) shows how these settings provide a space for different actors to get together and exchange knowledge about the underlying products. In what follows, we will inspect the role of 'software user groups' across the different stages of ERP software evolution. The group we studied has been functioning for over 25 years. We will also show that user groups can be an occasion for users to have a voice on the vendor's software development agenda.

In the early 1990's as the number of ERP users grew, new user groups were formed around the functional side of the ERP products. The user groups, which tended to operate around technical matters, such as database and operating systems, expanded into areas of ERP functionality, such as a financial applications special interest groups. The user groups create a many-to-many link where users not only meet with the vendor, but also connect to other users and intermediary organizations functioning around the vendors' products. This type of link, which is predominantly orchestrated by user volunteers, is open for participation to all users, rather than strategic users selected by the vendor.

There were two main strategies in managing user-developer relationships in user groups. Primarily this type of link encouraged 'collective diversity' (Mozaffar, 2012b). The user organizations which attended these sessions came from different market sectors. They deployed various vendor products and technologies and had different interests in the products. This led to a spectrum of demands from the user group (Mozzafar forthcoming). Some participants attended the meetings to be informed about the future products, while others wanted to get onto the vendor's radar and be able to influence its strategies. Hence 'collective diversity' which was a communal and joint action of users with diverse needs and interests are formed to meet the varied demands.

The study showed that user groups in their early days were spaces for the vendor to reach all customer segments through a single point of connection. The vendor organized events to stay connected to the users and the users attended the meetings to receive knowledge directly from the vendor. The meetings also provided a space for user-user discussions around their respective problems. As the vendor's product range grew, so did the functionality of the user groups. Over the years, the users demanded greater ownership over the activities performed by the group. After users joined the organizing board, the user

group structure gradually reformed to become an independent, user-managed organization. The reform of the structure from a vendor-controlled user group to a more user-organized community, opened up the opportunity for user organizations to broaden their activities. The user organizations sought to use the group to create a collective voice that could lead to a closer proximity with the vendor. At the same time, the vendor enjoyed a closer proximity to the knowledge and status of a large number of customers. In this way, unlike the previous types of user vendor relationships, we could see users having a voice on the vendor's software development agenda. This led to the second strategy used for managing vendor-user relationships in user groups, which we will call 'orchestration' (Mozaffar forthcoming). Orchestration refers to the act of community organizers provided space for a mutual configuration between diverse types of actors (e.g. users, intermediaries and vendors) with different concerns and commitments allowing them to act together but at the same time leaving the details of interaction to be decided by the participants of each group.

These user groups, supported orchestration across the entire product lifecycle, from design and development phase, to support and even in some cases after the product is de-supported by the vendor. However, the nature of the functions of the group could change as for example as a product matured or as a group became more experienced (Mozaffar 2012a). For instance, a group that acted as a mere information exchange group could turn into a user innovation community *(ibid)*.

The 'orchestration', initially introduced by the vendor and later administered by a joint group of different types of actors, benefited users and the vendor by lowering the tensions of the vendor-controlled relationships throughout different stages of the product lifecycle. However, the new nature of the link introduced new types of tensions. The management of power relationships between the users and other actors in this arena is the most evident challenge. The collective nature of users' actions resulted in new user expectations. It created a collective voice that could contradict vendor's strategies. Thus the vendor may not see 'generic needs' articulated by the user group as representing worldwide generic need and can hence challenges its claims to generality. Despite its challenges, the user group type of relation provided a platform for the wider user base to be linked to the vendor and it was known as an 'essential bond' by both vendors and users. Users referred to the user group as the main method of 'getting onto a vendor's radar' and vendors addressed them as the 'stage to stay connected to all users'.

]INSERT TABLE 3 HERE OR IN SECTION 6]

6. Discussion: Prosumer management strategies

The two cases compared here are presumably close to maximum variation (Flyvbjerg 2006), giving insights into the implications of their very different characteristics in relation, for instance, to the number and type of users, usages, type of system and organization of development work: an online-game with social network features available free to millions of teen users and an expensive and complex corporate information infrastructure sold to large private and public sector organisations worldwide. Despite these differences, careful long-term examination of their user-developer relations reveals striking homologies between these cases. These homologies are more interesting than the differences precisely because of the high variation between the cases, since the homologies are likely to be shared by other cases within the examined space (Rihoux, 2006). We can identify a range of specific *prosumer management strategies* that relate to managing the tensions underpinning the design and development of products geared towards a mass market of users. Table 3 summarises seven prosumer management issues that our analysis has identified: Generification/Localization; Collective diversity; Developer–User social distance; User innovation; Community management tactics; User categorizations; Knowledge infrastructure. Table 3 summarises how the strategies related to these issues were deployed in each case. The right hand columns pull out differences and similarities between the cases. We briefly outline these different strategies and then explore in more detail how they were exemplified in our cases.

Our earlier work has drawn attention to the *generification* processes by which software products were made available as standard generic solutions to diverse markets. Developers needed to decide which user requirements would be met within the standard product. This also involved decisions regarding what kinds of diversity of function and local adaptation was enabled as well as the *collective diversity* of user practices.

Given the *social distance* emerging between developers and their growing user communities, software/service suppliers developed increasingly intricate *knowledge infrastructures* deploying a variety of qualitative and quantitative research methods to acquire and maintain an adequate understanding of their users. Layered with these were automated information gathering analysis means, the organization of different types of community

groups to gain information from users and direct tapping onto added content created by the users including the innovations they had made. These arrangements evolved over time, with vendors resorting to different combinations of instruments, as the user base was both expanded and extended. In general we note the resort to large-scale quantitative research methods, analysis of data on the use of systems and collective fora as an economic means of understanding an *expanded* user base. However, when services were being *extended* purposefully to a novel market, the vendors' prior knowledge of existing user base was not fully portable. Under these circumstances the vendors again sought more direct engagement with new users.

Active *community management tactics* were also in play – in relation to technical support as well as systems development – with some user-relations functions migrated out to trusted 3rd parties where this was expedient. Users themselves were not passive but became actively involved for example in organizing user groups and fora – mainly online in the case of Habbo and face-to-face with enterprise systems. The circumstances for their involvement changed as the product and its markets evolved and were conditioned by the strategies of vendor organizations to channel and manage their responses. Users were a source of knowledge about (acceptance, usability etc. of) existing offerings, and also developed new content, new activities, and new ways of using the system that were a potential resource for further product innovation (*user innovation*).

Though the creation and early history of these products differed, both emerged through the supplier's early direct links with a limited number of users. As the user base expanded *generification* was about limiting product diversity and economizing in terms of the level of knowledge the supplier needed to maintain about specific users their contexts and purposes, thereby simplifying product development and support.[iii] To accomplish this both vendors deployed a range of mechanisms through which their community of users could be apprehended. And in both cases we saw a shift from direct (one-to-one) contact with users e.g. through interviews to towards larger-scale (one-to-many) methodologies including large-scale surveys and the use of data analytics. As Johnson and Hyysalo (2012) point out, large scale methodologies have strengths – in terms of their ability to address, cheaply and efficiently, large numbers of user responses and to generate generalized and generalizable accounts of these. However this quantitative knowledge is erected on and complemented by more detailed knowledge of users derived from direct engagement.

A key part of user management strategies was that vendors developed ways of *sorting and categorizing* their user-base. This involved segmenting the IT system and also the user market in terms of their perceived economic importance and fit with the vendor's business models (Pollock, Williams, & D'Adderio 2007, Johnson 2013) and also generating characterizations of classes of users in terms of their purposes, behaviour and ways of using systems. By making users similar (i.e. by invoking the idea that there were groups of users that were broadly similar or that could be treated as if they were similar), these user categorisations provided more manageable ways for developers to think about their services and how they could be supported and further developed. These proxies for imputed actual users could be deployed in managing their services and in developing products. They were not so much collective representations of actual users as aggregates of how different user sub-sets appeared through the lens of the provider's commercial strategy. Segmenting users in this way also made future targeted users less unknown as future (currently unknown) users could be treated as occurrences of one or more established categories of user. However, once again we see the same dynamic that when potential market segment became identified, also more representative forms of categorizing the user again came into the fore.

In all, vendors of information infrastructures seek to *manage users* – prefigure their actions individually and collectively – but are by no means able to 'configure' the user in anything like the mechanistic way that Woolgar's (1991) description of computer hardware casing is occasionally be taken to suggest. Successful information infrastructure suppliers seek to develop ongoing forms of relationship with their customer-base. This is because user requirements and expectations are not fixed but evolve. Vendors may have to introduce new functionality in response to innovation by competitors (as we saw when Habbo adopted social networking features). But it is equally because users are active themselves.

In both of these cases studied we note the establishment and ongoing operation of User Groups and online fora. Online fora allowed low cost access to large numbers of SM users; the more substantial time and money costs of participation in face-to-face User Groups were sustainable with mission critical enterprise systems. The fora provide spaces where the user can operate semi-autonomously. Thus OUG operates semi-independently of the vendor and came to provide a space for generating and circulating ideas about product enhancement and new practices of use. The developers of Habbo discovered that the 3rd party websites that sprung up provided a way for them to understand their users better as

well as to introduce/explain their services to new users along with first-line troubleshooting and technical support. Later then sought to police the behaviour of these sites (e.g. by accrediting those which did not for example circulate 'cheats' and other use practices that were considered undesirable).

Vendors do seek to manage these communities. However they are not able to do this unilaterally, but must collaborate with/accommodate their user communities and 3rd parties. The cases give us insight into *community management tactics* and how they varied between settings and as communities and products evolved. Thus we saw how some user-relations functions were pushed out to the community. At other times activities were pulled back in to the vendor organization (as we saw when the developers of Habbo brought certain user support functions back in-house, e.g., moderation and fora). These shifts reflect another tension that needed to be managed, and was managed differently as the product and its user base evolved - between the benefits of shifting responsibility for activities to 3rd parties, close to the users, versus the advantages of bringing functions in-house – in particular of exercising more control and being seen to exercise responsibility.

7. Conclusion

STS work from its earliest stages has focused on the 'user problem' in design: the risks that developer presumptions may be out of alignment with the actual needs of users and the consequent need to develop an adequate understanding of users and their purposes (Stewart & Williams 2005). The question that human-oriented design traditions are facing today is: how can this knowledge be achieved for the robust development of IIs that have an enormously wide range of users and a long lifetime (measured in decades rather than years)? Prevalent discourses of Web 2.0 and social media convey a generic image in which user and developer are now fully integrated. Notions such as 'prosumerism' have been used to describe this blurring of the relationship between the consumer and producer (van Till and Hey 1988, van Dijck, 2009).

STS research suggests that we need to interrogate these developments in detail. This is by no means a trivial task. In an overall innovation process that is dispersed across time and social space, key developments take place in a space that remains largely unstudied. We have explored these through two extended studies, informed by the biography of artefacts perspective, of the development of two contrasting information infrastructures - an

enterprise system and a social game/online community - encompassing the vendor and their relations with their communities of users. We showed that vendors have over time put into place a complex set of arrangements (i.e. knowledge infrastructures) for understanding and managing their relationships with their user community. We observe that these arrangements are far more intricate than current discourses on Web 2.0 and social media would suggest. Our study has thrown light on how these knowledge infrastructures have evolved over time and have been adapted to meet particular exigencies as the product and its user community has grown and been extended to other user markets. This evolution has been subject to competing pressures and contradictions. For example, we explored the tension between on the one hand economising in knowing the user and, on the other, responding where expansion turns into extension and calls into question the existing knowledge base and codified representations of classes of user. Though we might describe this as a process of mutual construction between producer and consumer, we seek to avoid portraying it as a smooth co-evolution process of learning and adaptation. Instead we found a trial and error "social learning" process (Williams et al. 2005; Hyysalo, 2009) in which predicted and unanticipated shifts in the community of users and their requirements called into question the ways in which vendors previously understood and managed their relationship with their users.

Though our focus has been on the efforts of vendors to manage these relations, the development of knowledge infrastructures is by no means a process that is unilaterally shaped by technology developers. Instead we find a complex web of relationships between vendors and their users. The benefits of sustained collective relationships with their user community led vendors to support the formation user communities and fora – which opened up opportunities for users to exercise independent action as well as to collectively influence vendors. Vendors found it advantageous under some circumstances to push responsibility for functions out to 3rd party organisations and at other times sought greater control by bringing activities back in-house.

Our research has explicated the complex interplay between vendors and users in technology development and use, and their evolution over time, subject to various trade-offs and tensions, for example between competition and collaboration, and between localisation and generification. We have drawn insights from examining differences and similarities in how these played out in the development of two sharply contrasting information

infrastructures over time, where we identified important parallels in prosumer management strategies. The identification of these similarities, through our *Biography of Artefacts (BoA)* framework, across cases at the opposite end of the spectrum gives a framework for reasoning about future cases and what kind of patterns are likely to be at play. We argue the wider relevance of these findings. This does not entail proposing that the biography of information infrastructures follows a fixed set of evolutionary stages or prosumer management strategies. It does suggest, however, that prosumer management strategies are likely to be at present in other cases as well. Overall our work debunks prevalent rhetoric about the dilution of producer and user distinctions into simple 'prosumers' and 'produsage'.

 One interesting avenue for further research would be to explore how these arrangements may vary between settings. For example, both systems we examined were built around a single corporate vendor. How might these issues be addressed in innovation in open source systems?

Science and Technology Studies has a particular contribution to the study of these issues, with its emphasis on the need to 'open the back box' of technology and investigate the spaces in which social media and other information infrastructures are constructed. To address these, some reworking of traditional STS methodologies and analytical frameworks is required to go beyond short-term 'localist' studies of particular settings of product development or use (Pollock and Williams 2010). The Biography of Artefacts and Practices perspective (Pollock and Williams 2009; Hyysalo 2010) outlined here, represents a part of a broader intellectual effort to map out a revised set of analytical templates and frameworks for conceptualizing these information infrastructures and studying them empirically (Hanseth, Monteiro and Halting 1996, Bowker and Star 1999, Edwards et al. 2007, Pollock and Williams 2010, Monteiro, Pollock, Hanseth & Williams 2012). The contribution of this paper has been to highlight the elaborate knowledge infrastructures and community management strategies, linking suppliers and their user communities, that suppliers have deployed to sustain an adequate understanding of their diverse and changing body of users and orchestrate their uptake and use of a stream of innovations over long timeframes. Though noting the increasingly elaborate knowledge tools and strategies deployed by vendors, we further suggest - extending Koch's (2007) proposal that (ES) technology should be analysed as a 'community' - that innovation in information infrastructures needs to be analysed as a 'community achievement'.

Finally we note that many forms of contemporary technological innovation in late capitalism share many of these 'infrastructural' features. We hope the insights developed here will help STS more adequately address the dynamics of current late modern technology production. They have particular relevance as we seek to understand the sociotechnical character and implications of social media today.

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