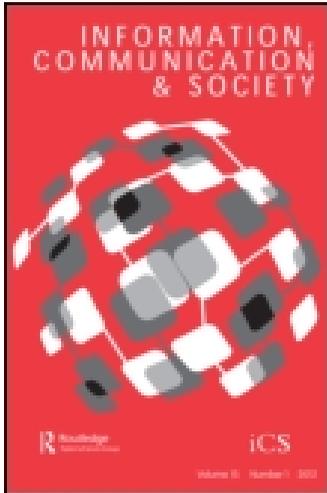


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### The managed prosumer: evolving knowledge strategies in the design of information infrastructures

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

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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 third-party organizations 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.

**Keywords:** generification; knowledge infrastructures; community management strategies; developer–user relations; social distance; user categorizations; user innovation; science and technology studies

### 1. Introduction

The conception of social media (SM) 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

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that were encountered with previous generations of Information and Communication 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 (Bruns, 2008; Toffler, 1980). 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, 2008). In this way customized 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* (ES) – complex and expensive software products used by many large private and public sector bodies to support the wide range of organizational functions. Using two such 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)* (Hyysalo, 2010; Pollock & Williams, 2009).

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 characterize 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 and information systems/infrastructures over time (Williams & Pollock, 2012).<sup>1</sup>

Pollock & Williams (proposing the Biography of Artefacts 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 organizational 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) have, from their earliest inception, been concerned with materiality (Leonardi, Nardi, & Kallinikos, 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, Carne, Beynon-Davies, & Tudhope, 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, & Slack, 2005). When developing systems for multiple users, some have warned that the wide range of specific user requirements, needs and concerns may be overlooked in favour of generalized views (‘design for everybody’: Oudshoorn, Rommes, & Stienstra, 2004; Woolgar, 1991).

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 & 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 to current and future users/uses, highlights the difficulty, indeed implausibility, of designing artefacts that cater to 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 IIs that are common to SM 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 of 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 & 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 priorities depending on their perceived strategic importance for the provider. Equally, Johnson and Hyysalo (2012) have shown how the SM 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 SM 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 recognized 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 resorting to increasingly large-scale methodologies (shifting from direct contact through interviewing/observing users to larger-scale surveys and the use of data analytics). A parallel social distance has been noted in ES 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, & 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 & 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, 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 & Pollock, 2012).

In the current paper we compare the analyses of biographies of two contrasting software products as they move across organizations, from one national context to another, and from a small to a larger user base. The selected packages (an ES software package and a SM service) 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 from the Biography of Artefacts and Practices perspective (Hyysalo, 2010; Pollock & Williams, 2009), 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 (ES and SM services). We wanted to reveal the extent to which a biography approach was able to revisit the now well-rehearsed account of SM 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 SM 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 SM and ES. 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*

#### 3.1.1 *Social media*

Habbo Hotel is one of the oldest and most popular SM services in which children and teenagers meet, socialize and play many types of games. Between 2003 and 2010, the service expanded from 4 localized 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 45 minutes per day in the hotel or on its related discussion forums.

Our data were gathered from both developers and users through a multi-method approach with varying intensities over eight years (2003–2010) and have 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, 10 theme interviews with Habbo developers and 3 focus group interviews with 12 Habbo users were organized. 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 SM service. This case is representative beyond its target group and games to SM in general because of similarities in software business, group communication functionality and active user communities (Johnson, 2013; Johnson & Hyysalo, 2012).

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 organizational 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).

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. Internationalization 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 a different code was used in different countries). Complexity refers to the extension of the product to a social networking service, from 2006. Competition describes a period in which SM services for children and teenage adoption of Facebook increased. The data are reported in more depth in Johnson (2013).

Table 1. Habbo service evolution.

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 2. ES evolution.

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

3.1.2 Enterprise systems

The case of 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 organizations 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 customer relationship management [CRM] module for the Higher-Education Sector, a more advanced cloud-based version of the software). Third, we continued to study this particular enterprise resource planning (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 (Campagnolo, 2013; Mozaffar, forthcoming; Pollock & Williams, 2009).

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-profit organization, which was run and organized by user volunteers. Table 2 shows how we summarize the evolution of ES over time.

#### 4. Strategies by which firms manage user relationships in SM

##### 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 email 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 the user base in different hotel countries.

As the monthly number of users approached one million in four different countries, hotel-specific country organizations emerged as intermediaries between end-users, volunteers and the centralized 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 internationalization and more organized 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%. In 2005–2006 Sulake brought the moderating function in-house, by employing moderators in their country offices. The volunteer programme 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 programme 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.<sup>2</sup>

In the competition stage, global competition and multi-sided business grew in importance. In 2009, a new approach to characterizing 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 SM case, we now turn to examine the strategies in the ES case.

## 5. Strategies by which firms manage user relationships in ES

### 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 organize 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 et al., 2007).

An important aspect of this *segmentation* phase was designing the software architecture in such a way as 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 organizations, 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 is 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 (OUG) 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 1990s 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 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 (Mozaffar, 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 is 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 that 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 (Mozaffar, 2012a).

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 challenge 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'.

## 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 II sold to large private- and public-sector organizations worldwide. Despite these differences, careful long-term examination of their user-developer relationships 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 summarizes 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. The table demonstrates 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 were 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 them resorting 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-relation functions migrated out to trusted third parties where this was expedient. Users themselves were not passive but became actively involved,

Table 3. Summary of prosumer-management strategies in SM and ES cases.

	SM case	ES case	Differences	Similarities
Generification/localization	From a project in one country to service across countries; from country-specific service to language regions; features into core system	From organization-specific (identification stage) to generic functionalities, across organizations and across sectors	Different levels of localization in ES case. Generification and localization done in greater number of phases in ES case	Generification sought whenever possible. Done at multiple levels. Localization significant with new versions and markets
Collective diversity	Broad diversity in orientations and countries after millions of users and internationalization	Broad diversity in user interests and functional fields. Working collaboratively in user groups towards collective but numerous selective goals	Different types of activity involved (play vs. work)	High diversity of people, use contexts and user orientations
Developer-user social distance	First developers were users; later increasing distance with changing target group (younger demographics, parents), increased diversity and age/generation gaps	Some users in organizations close to developers, selected user organizations close to vendor, increased distance with bulk of user base, user groups and conferences to diminish high distance	In SM case distance grows steadily as the number of users increases. In ES distance varies according to position in market and maturity of market	Significant variation over lifespan of system. Highly uneven distance within and between users and developers: some users and some developers close even at times of high social distance amongst others
User innovation and user-added content	Fansites; user collectives; tweaks and subverting; imported formats; invented games; layers of imaginative play	Localizations; customizations (e.g. added forms, added reports); application extensions (e.g. added modules, interfaces to other applications); new configurations	The type of user innovation and user-added content differs, some user customization allowed in ES, while coding modifications discouraged in SM	Crucially significant to the success of both systems. Wide variety in both. Developers actively embrace and manage user-added content
Community-management tactics	Volunteers programme; local country offices; official fansite programme; open-ended design of spaces for user creativity, critical system parts tightly scripted; summer meetings; centralization of community management	Kernel-template or core detail; user groups, requirements and usability workshops, authorized consultants; requirement screening by developers; contractual agreements	Different content and issues reflecting the use and users of the SL and ES	Active community management important aspect of development of both systems. Multiple forms of engaging users with multiple functions
User categorizations	Potential and saturated market users; typical usages, market segments, persona descriptions. Biased user groups, 'average user', 'habbo-way' safe youth environment	Market segmentations; big and small markets. Within market user segmentations; strategic, consultative and transactional customers, specific user designations such as 'strategic user'	ES has more differentiated markets and more structured sets of roles for different kinds of users	User abstractions not representational, but serve strategy. They are cumulatively produced and their importance varies
Knowledge infrastructure – how providers know the market	Easy access to avatar activities; email feedback; volunteer forum; weekly polls; Web analytics back-end; CRM system; automated surveys; user and group homepages; tags. User Experience (UX) tools: market surveys, focus groups, usability evaluation, playability testing, online user panels, global youth surveys, user experience testing	Forums; user group meetings; UX usability feedbacks; user group conferences; contractual agreements; orchestration of user activities; UX tool use: market surveys, user group surveys, online user forums, user experience testing, ethnography, prototypes	ES has more orchestrated physical user group meetings and other physical engagements	Elaborate mix of arms-length digital platforms and tracing, Organizing of more direct contacts and collaborative engagements. A range of UX tools deployed cumulatively, the tools only a subset of knowledge infrastructure and prosumer-management tactics

for example, in organizing user groups and fora – mainly online in the case of Habbo and face-to-face with ES. 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 suppliers' 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.<sup>3</sup> 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 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 vendors' business models (Johnson, 2013; Pollock et al., 2007) 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 categorizations 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 providers' 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 segments became identified, also more representative forms of categorizing the user again came to the fore.

In all, vendors of IIs 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 taken to suggest. Successful II 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 ES. 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 third-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 they 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 third 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-relation functions were pushed out to the community. At other times activities were pulled back into 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 third parties, close to the users, vs. the advantages of bringing functions in-house – in particular, 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 SM 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 Dijck, 2009; van Till & Hey, 1988).

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 and practices perspective, of the development of two contrasting IIs – an ES and a social game/online community – encompassing the vendors 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 SM 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, economizing 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 (Hyysalo, 2009; Williams et al., 2005) 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 third-party organizations 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 localization and generification. We have drawn insights from examining differences and similarities in how these played out in the development of two sharply contrasting IIs over time, where we identified important parallels in prosumer-management strategies. The identification of these similarities, through our *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 IIs 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?

STS 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 SM and other IIs 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 & Williams, 2010). The Biography of Artefacts and Practices perspective (Hyysalo, 2010; Pollock & Williams, 2009) outlined here represents a part of a broader intellectual effort to map out a revised set of analytical templates and frameworks for conceptualizing these IIs and studying them empirically (Bowker & Star, 1999; Edwards, Jackson, Bowker, & Knobel, 2007; Hanseth et al., 1996; Monteiro et al., 2012; Pollock & Williams, 2010). The contribution of this paper has been to highlight the elaborate knowledge infrastructures and community-management strategies, linking suppliers and their user communities, which 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 IIs 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 SM today.

## Notes

1. A corollary of this is that developing an adequate understanding of information infrastructure evolution is of necessity a team task (Williams & Pollock 2012). Unusually for this paper we are able to bring together two extended biographies of IIs.
2. Recent events concerning lapses in online moderation reported in UK media in June 2012 again changed the volunteer programme. New safety measures have been introduced, parents and users were invited to

express their views on how to make the service safer for teenagers, and moderation was again opened up to user community volunteers.

3. In contrast to the concerns previously expressed by Oudshoorn et al. (2004) that attempts to ‘design for everybody’ would result in design for nobody, we found that the design of IIs involved purposefully creating social distance from particular users e.g. sifting out specific ES requirements that might limit wider system uptake. Similarly SM design around user abstractions based upon ‘average user’ was seen as offering a reflective counterbalance to particular vocal user groups in earlier releases (Johnson, 2007).

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