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DIVERSITY AND CHANGE OF USER DRIVEN INNOVATION MODES IN COMPANIES

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User driven innovation (UDI) is a popular term in policy and corporate circles. However, it is not clear exactly what UDI means and how such practices are used across the spectrum of companies and over the innovation life cycle. The present study compares 58 UDI showcases in Finnish companies in order to analyse the diversity of UDI practices and their evolution over time. We identify five main modes of UDI and show how the ways of using UDI develop over time in individual companies. In almost half of the examined cases, the dominant mode of UDI changes at least once, and in some cases, up to three changes in dominant mode are observed. We then proceed to identify six qualitatively different ways in which companies' orientation to UDI evolves over time. The study has implications for innovation management and policy: It calls for greater attention to UDI diversity and particularly to the management and support of the continuity of UDI efforts.

Keywords: User driven innovation; case study; comparative study; companies; innovation management; innovation policy; user involvement; user innovation; participatory design; user centred design; marketing research.

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Introduction

User driven innovation (UDI) has gained increasing attention throughout the 2000s in innovation practice, research and policy alike. No longer seen as a fringe activity, users have been brought to the centre of attention in innovation projects as participants, informants, sources of designs and sources of inspiration. The gains sought from users include better transfer of user information to companies, more appealing products, utilising users' efforts and skills in product development, as well as gains through their involvement in marketing, delivery, business model development and greater likelihood of user acceptance.

Despite considerable bodies of academic research, and indeed also because of them, the definition of UDI has remained somewhat elusive and subject to debate. In some formulations UDI means new emphatic awareness of user identities and contexts that designers can bring to companies (FORA, 2009). Advocates of user centred design (UCD), however, tend to insist on more exhaustive and methodological engagement with users (Norman and Draper, 1986; Benyon *et al.*, 2005). Even more forcefully, many insist that the core of UDI is innovation by active users and user communities (von Hippel, 2005; van Abel *et al.*, 2011), or participatory innovation (Buur and Matthews, 2008; Bødker *et al.*, 2004). At the opposite end, UDI has been seen by policy makers as advanced early-stage customer research, rendering UDI arguably a more commonplace, yet also a more incremental addition to R&D practices (MEE, 2010; DAMVAD, 2009). Particularly in the UK UDI has been seen as a subset of open innovation (Piller and West, 2014), whilst this has not been the case for instance in Scandinavia.

Each camp holds good arguments as to why their view should define UDI and why others miss their mark. Further ambiguity in UDI results from the frequent blurring of normative, visionary, commercial and academic registers in addressing it. Views on how users *should* be engaged, how designers *could* create new concepts, and *what happens* in companies and other sites of innovation tend to overlap. This may be because companies fail to fully embrace UDI, or equally because UDI visions may be exaggerated. Additional uncertainty follows from the existence of hundreds of methods developed by consultants and academics, most of which have not been systematically tested for effectiveness.

Amidst all this rhetoric and development of tools, there is little research on how companies across industries work with UDI and how they integrate various forms of working with users in their innovation process on a more permanent basis. This is important because much of the policy, practitioner and academic discourse aims to get companies to experiment with some UDI methods with the (at least implicit)

assumption that this experimentation would result in more permanent changes in the way companies manage innovation (MEE, 2010; Ehrvervs-og, 2010).

The present study aims to address this gap through an analysis of 58 Finnish cases of UDI. We examine empirically what kinds of engagement between users and developers takes place in projects seen as UDI in companies and how the engagement of users evolves in companies that experiment with some form of UDI.

Answering this question requires a different combination of breadth and depth than research to date has provided. Surveys of UDI practice are scarce, and do not explore in detail exactly how users were involved in the long term (e.g., Gales and Mansour-Cole, 1995; van de Vrande *et al.*, 2009; Carbonell *et al.*, 2009). Studies that examine within-case dynamics in more detail usually only focus on a handful of selected cases (e.g., Lettl *et al.*, 2006; Heiskanen *et al.*, 2010).

We aim to go beyond existing cross-sectional surveys of user engagement in innovation. In doing this, we draw on advances in the literature on social learning in technological innovation (SLTI), a further development in the social shaping of technology (SST) literature (Williams and Edge, 1996; Williams *et al.*, 2005). Rather than presuming that UDI in real-life projects is comprised of a fixed set of elements, such as methods, the approach examines how the product, its developers, users and third parties are constructed in the course of the development project (Russell and Williams, 2002; Johnson *et al.*, 2014). It further points to procedures and apparatuses through which knowledge about users is accumulated in various actions created by companies, their suppliers and clients and used in advancing and managing innovation (Russell and Williams, 2002; Williams *et al.*, 2005; Hyysalo, 2010).

Our current analysis seeks a new type of analysis within the social shaping of technology tradition. SST and other science and technology studies have excelled at detailed case analyses (Bijker *et al.*, 1987; Sørensen and Williams, 2002; Rohracher, 2005). The avoidance of fixed research templates and the reliance on maxims such as "follow the actors" (Latour, 1987) have been apt for analysing highly contingent innovation processes. Generalisations have come by way of characterising patterns in innovation processes captured by concepts (Russell and Williams, 2002), sometimes elaborated as process models, such as those of domestication and social learning (Sørensen and Williams, 2002; Williams *et al.*, 2005). Whilst valuable, the lack of comparative studies has arguably limited the uptake of SST results within quantitatively oriented fields of innovation research and policy-making. Drawing inspiration from van de Ven's and Poole's (2005) ideas for combing a variance epistemology with a process ontology, we conduct a cross-sectional analysis of 58 cases in order to identify how patterns of UDI are distributed over cases. We avoid further quantitative modelling in order to preserve the ecological validity of detailed process analyses (Garud and Gehman, 2012).

We contribute to research on UDI by empirically analysing how a variety of companies in different industries engage users in their innovation processes and, in particular, how these ways of engaging users develop and evolve over time. On the basis of this analysis, we identify six change sequences that companies can experience after initial experimentation with UDI. To the best of our knowledge such investigations have not been carried out before.

In the following sections, we examine different modes of conducting UDI and how the social shaping of technology approach helps to understand this. We then proceed to identify diversity and change in companies' ways of engaging users. We do this first by examining how the company UDI mode changes from one dominant mode to another, and second, by examining how the same orientation changes with regard to contents of the UDI processes, and linking these back to the social shaping of technology literature. In conclusion, we discuss the managerial and policy implications of the variations and transformations in UDI modes.

From Modes of User Driven Innovation to Analyses of Developer–User Relations

The term UDI is of relatively recent origin, surging to the fore in national and OECD policy programs after the turn of the millennium (see FORA, 2009 as an example). The surge, however, owes itself to a set of phenomena in innovation that has been known and has grown over decades.

Collaborative design as an approach to develop new workplace and later leisure products owes its academic roots to sociotechnical design in the 1950s and participatory design initiatives in the 1970s, which gained increasing impetus in more mainstream development practices towards the turn of the millennium (Greenbaum and Kyng, 1991; Voss *et al.*, 2009). It has found further expression in, for instance, real life development environments such as living labs (Hillgren *et al.*, 2011). Yet intense design collaborations (DCs) have taken place between interested developers and users, oblivious of academic endeavours (e.g., Lundvall, 1985; Williams *et al.*, 2005; Hyysalo, 2010). Collaborative design can thus be more neutrally described as design collaboration (DC) to include those DCs "in the wild" (Hyysalo and Lehenkari, 2002) that have taken place across decades but remained academically mostly undocumented.

User innovation (UI) is another well-known phenomenon, brought to gradual prominence by a series of studies since the 1970s, spearheaded by Eric von Hippel and the research community around him (von Hippel, 1976, 1988, 2005; Flowers *et al.*, 2009, 2010). In some special areas, such as scientific instruments, 80% of innovations have been reported to originate from users. It has been reported that

19–36% of users of some industrial products develop or significantly modify the products they use and 4–6% of consumers modify some products they use (for summaries see von Hippel, 2005; DeMonaco and von Hippel, 2013).

User centered design emerged in the early 1980s (Norman and Draper, 1986; Dix *et al.*, 2004) and has since grown and diversified into areas such as interaction design, user experience design and service design (Preece, 2002). Various UCD methods and techniques are used widely in software application design and industrial design. UCD's most distinctive legacy to UDI has come through the idea of ethnographic and other contextual studies on users as the basis for product and business development (Benyon *et al.*, 2005; Whalen and Szymanski, 2005). Particularly, the studies that focus on user value enhancement as part of product design were influential in the formulation of, for instance, Danish UDI policies (FORA, 2009).

UDI has also been seen to include variants of user studies that are more traditionally oriented toward design practice. These can be characterised as *user inspiration for design* (UIFD) where users are investigated more for inspiration than for grounding design (FORA, 2009; MEE, 2010). The academic versions of designer driven approaches include substantial investigations of user contexts and experiences (Mattelmäki, 2006; Sanders and Stappers, 2012), but most usages in industry rely on less documented and more intuitive engagement with users; the aim being to create products that would be usable and aesthetically pleasing for users. It is this latter meaning of UIFD that we employ in the current paper.

Finally, UDI has been seen to include advanced customer and market research methods such as data analytics, particularly in policy programs (cf. MEE, 2010). Drawing the boundary between UDI and deploying variants of marketing research in companies is difficult. Nonetheless, particularly for many small- and medium-sized enterprises (SMEs), more qualitatively-rich *studies on use* (SU) with prospective users can hold novelty value and reframe innovation efforts even when the companies develop their established offerings and we have included such more in-depth studies of use within UDI also in this paper.

In summary, UDI is not an academically or managerially unified field, let alone a unified concept. Yet the elements that can be found in most UDI formulations have discernible origins and are associated with academic research traditions.

However, these formulations may correspond more or less closely to what actually occurs in companies experimenting with ways of engaging users in their product development processes. Product and service development is commonly viewed as a sequential process in which tasks take place one after another. It is seen to take place in an organisational setting, either within an organisation or between organisations, but may also involve actors outside organisations, including co-creative user communities and individual users (Piller and West, 2014;

Prahalad and Ramaswamy, 2004; Chesbrough, 2003; Ulrich and Eppinger, 1995), also reflecting varying levels of openness and engagement (Vanhaverbeke, 2006; Earthy *et al.*, 2001). Such formalised processes may describe new product development in large companies with dedicated product development units. The linear progression is less likely in the case of more complex and innovative products (e.g., van de Ven *et al.*, 1999; Sørensen and Williams, 2002). Similarly, formalised process depictions are also questioned by the practices of SMEs and companies that lack dedicated product development units and rely as much on the entrepreneur's talent and networks as on formal planning processes (Mayer-Haug *et al.*, 2013), which both appear as recurring features in many of the Finnish UDI cases we examined. User engagement in product development did take place in the studied company cases, yet it was seldom strictly formally organized according to formal R&D processes. For instance, in the course of the innovation process users provided requirements, screened proposed solutions and contributed resources to product development in multiple ways, i.e., users engaged in a developer–user relationship. Our cases suggest that we need to view the organising (Czarniawska, 2008) of product development differently if we wish to understand how it relates to users, particularly when it is carried out in SMEs that operate in markets not usually associated with technical product development (Cox and Frenz, 2002).

To do this, we draw from the SLTI framework (Procter and Williams, 1996; Williams *et al.*, 2005; Stewart and Hyysalo, 2008), which is specifically focused on interrelations between developers and users. SLTI is a further development of the Social Shaping of Technology (SST) approach (Williams and Edge, 1996; Russell and Williams, 2002), which examines technological development not as a linear or deterministic process, but as one that involves social choice in the course of innovation. This choice is presented as a garden of forking paths where technical, social, economic and organisational considerations are weighted and acted on contingently by different actor groups. SLTI has been dubbed by its advocates as "social shaping of technology mark II" (Williams *et al.*, 2005). This is because it has sought to extend the analysis of innovation activities to the sites of use, where innovations are further developed after their first emergence. As a corollary to the emphasis on use activities in shaping technology, SLTI has taken the developer–user nexus as its key focal point and stressed the interrelations between how uses, technologies, services and systems are represented, how they are configured, and how they are appropriated in different sites and moments of innovation.

In this view, "user driven" innovation activities form one part of the innovation process, which are usually complemented by other sources of user and market representation. Moreover, the way in which users are represented can change along the course of the innovation process (Hyysalo, 2010). Finally, since innovation is not merely a process of learning, but also one of interaction and struggle

(Williams and Edge, 1996, Pollock and Hyysalo, 2014), companies may be reluctant to challenge their existing mode of operation even when faced with new and potentially valuable input from users (Heiskanen and Repo, 2007; Williams *et al.*, 2005).

Analysing User Driven Innovation Within Cases: The Example of Elderly Care Floor Monitoring

We employ a two-phase research strategy: First, a case-by-case analysis and then a comparison across case descriptions. Accordingly, we first examined the 58 qualitative case descriptions diachronically, project-by-project (rather than, for instance, surveying the companies about their espoused UDI strategies), focusing on what kind of interaction between developers and users took place in different stages of the innovation process. The SLTI approach provides a useful analytic point of departure for analysing real-life company practices, since it guides the analyst to trace in detail how the materiality of products and services emerges and what kinds of networks form around them in each case (Sørensen and Williams, 2002). We allowed the case companies themselves to describe how and where a product development process started, what events took place, what kind of collaborations were part of the process, and how the process ended, without presuming or imposing a model or stages by which this should have happened (cf. Stake, 1995). This approach also allowed for a detailed accounting for non-technical product development, such as service concepts, business models, and new products comprising of features of existing products.

The data collection intensity and methods varied among the 58 cases we compare in this article. At the maximal end of intensity, case companies and their user sites were observed over several years, combining tens of interviews with ethnographic observation and analysis of documents (Hyysalo, 2010). At a minimum, we started off from publicly available project and product descriptions and then carried out narrative interviews with company representatives. In the interviews, a chronological frame for actions occurring during product development was construed, as well as documentation of whether and how any engagement with users may have taken place. The resulting descriptions represent the chain of what took place from the beginning of the innovation process to the end and commercialisation (Gubrium and Holstein, 1998). Appendix A provides the list of cases and the abbreviated name we use for each case in the text.

To appreciate how SLTI informs case analyses, let us examine an extended vignette of one of the innovation process in our case sample: how a fall detector for elderly gradually evolved to a safety floor monitoring system for elderly care

housing (from here on "elderly floor monitoring"), which has been reported at book length in Hakkarainen (2013) and in Hyysalo and Hakkarainen (2014).

Case Vignette 1: The analysed case of floor monitoring innovation has its roots at the Helsinki University of Technology, where a motion tracking technology was developed in the late 1990s. The suggestion to transfer the technology from intelligent environment demonstrations (Kymäläinen, 2015) into a gerontechnological device came from a manager of a large public nursing home. Because of this impetus, a group of researchers and students began to develop a system for detecting residents' falls in a nursing home environment. The students won a business idea competition with their concept in 2005, and set up a company around it with the prize money.

The first version of the "safety floor" was based on the designers' implicit assumptions about users and context of use: the system would inform nurses when a resident had fallen down, so that they could come to help them. The developers drew on their previous experience from surveillance technologies, and no formal market or user studies were carried out. Early efforts were targeted at technical development and the system was thoroughly tested in the university laboratory.

UDI entered into the innovation project in 2006, when the company joined a living lab led by the public nursing home that had suggested the transfer of the technology. The nursing home manager had become involved in the innovation activities because she had grown disappointed in the quality of elderly care technologies on the market. To change things, she wanted to bring living lab activities to the nursing home in order to achieve better, more reliable and more ethical care technologies. The living lab was supported by a municipal innovation fund and partnered with technology companies, one of which was the floor monitoring start-up.

Various alteration needs to floor monitoring surfaced shortly after joining the living lab. For instance, falling residents grabbed the backs of chairs and bedside rails and therefore rarely lay on the floor the way they had in the university laboratory tests. Also the nurses behaved in ways that developers did not expect, such as placing laundry piles on the floor, which the system identified as fallen persons. In turn, the technology monitored nurses' work in new ways and, for instance, made note of the aforementioned placing of laundry on the floor, which was against the nursing home's hygiene regulations. In general, residents were in a weaker physical condition and care work was more laborious than the engineers had expected. Furthermore, the system needed to be integrated with the units'

existing equipment and the nursing home building, taking into account fire safety regulations and municipal social and health care office IT security levels.

It also turned out that the developers had invested large amounts of time in creating unneeded technical features based on their assumptions about the nurses' work. For example, the engineers assumed that it would be useful to monitor the movements of the residents from the computer screen. In reality, the nurses neither had the opportunity to do this nor were interested in the movements of the residents; they would pay visits to rooms when wanting to know what was going on. The nurses also invented new uses, most importantly analysed data logs to prevent accidents. In general, the nurses needed something else than a fall detector.

From the user perspective, the initial system was at best a prototype, whereas the company saw their product as more or less finished and was in a hurry to commercialise it. Developing the system further and quickly getting it to work reliably became the new objective of the project, albeit tension remained between the nursing home's wish to have a tailored system and the company's wish to have a generic and profitable product. False alarms, technical bugs, cumbersome interfaces and integration problems began to frustrate both nurses and project workers. Eventually, the project workers' wishes turned into demands, and the user side refused to continue with the implementation until their requirements were met. The situation finally became so agitated that the project coordinator, one project worker and the CEO of the company resigned within a period of six months.

Amid tensions, an updated version of the user interface was launched a year after the beginning of the original implementation. After the staff changes, a functional form of collaboration began to develop and the newly hired project coordinator started to actively observe problems and to seek new development ideas.

When use became more extensive, the company more profoundly understood the system's impact on work processes and its key benefits. The night shift seemed to be the biggest beneficiary: the nurse on-call did not have to go around checking on the residents all night as earlier, because the system informed her if someone got up during the night. The sleeping elderly were no longer disturbed by the checks, bedside rails could be removed, and residents no longer needed assistance to get up. Floor monitoring allowed the nurses to help residents when they put their feet on the ground and an alarm was sent. A new kind of care and new kinds of work practices began to take shape, and it was due to the care professionals that the system had evolved from being a fall detection system to becoming a fall prevention system, which allowed more flexible "just-in-time" care rather than rigid routines, and provided support for the night shift.

During the project the start-up company merged with an established electronics company, and started to gain new customers. The project coordinator was hired from the user site to the company to train new users and act as a link between company and

customers, hence continuing UDI activities on the company side. Her role was now more limited, due to different development needs and budgeting, and the relationships with the customer organisations were much less intense than in the living lab phase. Continued UDI engagement was still needed as new customers provided new contextual challenges and differences in work practices, which led to requirements for redesigns. Due to high installation costs, sales focused on new rest homes, albeit newer buildings created new kinds of technical problems such as humid concrete, which required new algorithms for the system. After the living lab, the company initially adopted a tailoring strategy, and the system was fitted to each customers' needs and equipment. Eventually, this was found to be unviable, and a more generic product offering was developed, including a version that can be assembled on top of old flooring. By 2014, the monitoring floor has been installed in over 2000 apartments and has become a stable product in the market.

The nine year floor monitoring innovation process presents findings that are in many respects common in SLTI studies (Williams *et al.*, 2005; Hyysalo, 2010; Voss *et al.*, 2009). The innovation activities span across product launches, and there are different interests and actors shaping the innovation, which also affects its material and organisational form through the pursued technological paths and targeted value-points. The relationship between developers and users also undergoes changes from relatively sustained configurations to new ones. In the case on floor monitoring, there was first a year-long phase of developer-centred work, which then changed to three years of intense DC between developers and users in the living lab. This in turn changed into a lighter company controlled mode of user engagement with new customers as the innovation matured and the customer base expanded.

It is this phenomenon of diverse and changing developer–user configurations which we analyse in the following across multiple cases.

Comparing User Driven Innovation Across Multiple Cases

To date, SLTI studies have provided case-by-case evidence of UDI modes prevailing for some time and then changing in the course of the innovation project as we saw with elderly floor monitoring case vignette. This has given rise to criticism for making generalisations on limited empirical basis. To examine the generality of the phenomenon, we mapped 58 Finnish UDI cases to see whether and how these cases feature diversity and change in their dominant mode of developer–user configurations over time. Our research strategy was to examine each case description and highlight and then compare the changes in the developer–user configurations, the predominant sets of relations, as well as information and material exchanges between developers and users. While this suppresses the intricacy of

social choices in the processes, it does allow us to compare the diversity evident in the initial UDI engagement and potential changes in the dominant mode of UDI.

Our procedure for achieving comparison was that four authors first assessed the user-drivenness of 80 examples selected to promote UDI in Finland (at www.udi.fi, in Finnish), of which the authors had researched and written the large majority. Then, the assessments were compared and 58 cases were selected as passing the criteria for representing user driven innovation in companies by all four authors. The discarded examples were either descriptions of innovation intermediaries or experimental setups (i.e., not product development projects as such), or did not qualify as research cases due to having been described too superficially.

In the second stage, we classified the type of UDI evident at each stage in terms of five modes of UDI. This was done to analyse both variety among cases and possible changes in the dominant mode of UDI within each case. The characterisation of different modes draws on the UDI research traditions explicated in the section "From modes of UDI to Analyses of Developer-user Relations" and on findings on empirical counterparts to those research traditions in company practices (Hyysalo, 2009b). The five modes have been operationalised as follows for the current analysis (Table 1).

Procedurally, this second stage was conducted as follows: four of the authors independently coded each of the 58 cases according to five modes representing UDI: (1) UIFD, (2) SU, (3) UCD, (4) UIs, and (5) DC. Each coding began from the starting point of the identified UDI process and further codes were added if such major changes were observed in the developer–user configurations over time that the dominant configuration between developers and users had clearly changed. After each of the four authors had independently coded all cases, we set up a number of meetings to compare the codings. The coding was mostly uniform. In six instances coding by one of the authors differed from others. Such differences were solved by revisiting the original case description and carrying out extended discussions with the author who had written or become familiar with the original case description. Still, in two cases a majority vote 3:1 was used to determine the coding between two alternative ways to mark a transition, in all others agreement was reached after revisiting the data. Case Vignette 2 provides an example of how the cases were coded with regard to UDI modes.

Case Vignette 2: Coding the case of the bathroom concept for assisted living:

A group of social and health care professionals working with elderly and disabled people had long been frustrated with the bathrooms of the residential care facilities. The bathrooms were so large that people often needed assistance to use them, simply for the sake of the room size.

Table 1. Modes of UDI used in the current analyses.

Mode	Rationale	How generated	How stored and accumulated	How used	Examples in research
UIFD	Designers have user benefits as core of their work	Intuition, own experience, and/or encounters with users, secondary sources	Typically, no systematic storing or accumulation apart from product features	As background knowledge to ideate and refine design solutions	Using field observation to tune designers, (lighter forms of) emphatic design
SU	Gathering knowledge about markets and users of already established concepts beyond mere market research	A study, research or field experiment on users of an already ideated product	Typically, as a report and in a user requirements template	In setting user requirements, pruning the interface and usability, adding new features, altering some parts of the concept	Concept studies, consumer research, usability studies
UCD	Creating deep understanding of users and their context to ideate and design products	In depth studies on users; Ethnography, interviews, interactive prototyping, etc.	Typically, models of users and contexts, requirement, wireframes, mock-up prototypes	As a source for product ideas and a backdrop to assess viability of concepts	UCD
UI	Users invent products for themselves	Ideating and building a prototype	As a prototype, in users head, sometimes as requirements	As a starting point for further development	Innovation by users
DC	Deep interaction between developers and users helps ideate, refine and test products	In a series of meetings and visits and digital interchanges between parties	As requirement, prototypes, listings, recordings etc.	To ideate, refine and test product	Participatory design, co-design

> The care professionals felt that they wasted their valuable working time in helping even relatively fit people with their toilet activities, for no other reason than that the design of the room did not support the independent mobility of the user. The root of the problem lay in the Finnish building code for public toilets for disabled people, which is intended for toilets situated in places such as shopping malls and department stores. Since a proper building code for residential care facilities does not exist, construction companies use this code intended for public spaces. In addition to the increased need for assistance, this also creates other problems, such as a lack of sufficient cabinet space and too few electrical wall plugs.

When a new public nursing home was being planned in Puotila, Helsinki, the care professionals together with architects decided to tackle the problem. While listing user requirements for the new bathroom, they group quickly grasped that suitable furniture did not exist in the market. This meant that they would have to start the planning of the ideal bathroom for elderly and disabled people from scratch. They settled on a mock-up bathroom from plywood, which could be used to try out the ideas (code 1: UI).

The plywood room was then tested by elderly residents, nursing home cleaners, physiotherapists, and an expert from the rheumatism association. Based on the feedback gained from the residents and the experts, the designer group determined optimal movement trajectories for the user from the perspective of ergonomics. The goal of the design was to support the independence of the frail or disabled user.

After the testing period, the care professionals and the architects started to look for a cooperative manufacturer for their design. They contacted a Finnish company that specialises in designing, selling and marketing bathroom solutions for special user groups. The company was so impressed by the new design that they decided use its insights to revise their entire existing collection of bathroom furniture. Based on the original design, the company later redeveloped new versions of the bathroom for other user groups, such as people with memory disorder and hospital patients (code 2: UIFD). Today, over 25,000 bathrooms of this line are installed in different care facilities in Finland, Japan, Norway, Sweden and Russia. The design has been awarded a prize by the Finnish Ergonomics Association.

Both the bathroom concept for assisted living and elderly floor monitoring cases exhibit a clear-cut change in the developer–user configuration at the point of moving from perfecting the initial product to targeting larger and more diverse user groups. In some of the other 58 cases, the changes were more overlapping as

Table 2. Overall characterisation of the data-set.

		Number of cases
Company size	Small company (< 50 staff)	33
	Medium sized company	12
	Large company	13
Clientele	B2B	20
	B2C	27
	B2B and B2C	11
Offering	Product	33
	Service	16
	Product and service	9
	System	9
New or improved offering	New offering to the company	49
	Improved offering	9
Not yet on the market		5
Data	Long-term data	10
	Limited to one project	48

one mode persisted, but others became increasingly used and gradually gained dominance. The most complex case was Habbo Hotel, which is a virtual world for youngsters. Altogether 26 different ways mediated the developer–user relations during the 10-year course of service development. Yet, even here the dominant mode of engagement was relatively easy to characterise in four major phases, because we had extensive documentation available on the developer–user relations therein (Johnson, 2013; Johnson *et al.*, 2010).

Appendix provides the basic features of all 58 UDI cases with respect to the size of the company involved, type of clientele, nature of its offering, and the novelty it represents, as well as whether we have long-term data on the case. The cases represent a variety of industrial sectors such as digital services, health technology, hospitality, ICTs, retailing, and sports equipment. Table 2 condenses this information into descriptive statistics.

Modes of and Changes in User Driven Innovation in Companies

Distribution of initial and final UDI modes and the number of changes in between

Let us begin comparisons by examining the initial distribution of dominant UDI mode in the cases (Table 3). The greatest number of cases (17) began as inspiration for design (UIFD). These cases targeted user benefits as the core of their offering, which turned designers to focus on users' desires, contexts and preferences. Yet formal user engagement or formal information gathering was not

Table 3. Distribution of cases according to UDI modes and transitions in modes.

Mode of UDI	As initial UDI mode (number of cases)	As final UDI mode (number of cases)
UIFD	17	22
SU	9	14
UCD	10	8
UI	15	3
DC	7	11

conducted. Similarly there were nine cases of SU targeted at refining an already established concept. UCD was dominant in ten cases, in which extensive and systematic investigation was conducted on users and their lives and contexts, the results serving as the impetus for developing new concepts. Fifteen cases began as UIs and seven with intensive DC between users and developers.

The distribution of UDI modes in the 58-case data-set is considerable both regarding the initial and the final mode and hence witness to the diversity in the meaning of UDI in companies. Truncating UDI to a single engagement mode such as UCD or UI, would leave out a significant number of user driven efforts undertaken in the companies.

We next take a look at the changes that companies' UDI went through during the process of innovation and which present an added element of diversity. The phenomenon of changes in the dominant UDI mode in company product development cases has not gained much attention in UDI literature. The exceptions are observations of lead users turning to user innovators and manufacturers or alternatively revealing their designs for companies to commercialise (von Hippel and DeMonaco, 2013), as well as the usability maturity models of the 1990s, and open innovation maturity models of 2010s where the company mode of user orientation was seen to deepen or lessen (Earthy *et al.*, 2001; Enkel *et al.*, 2011; Kuutti *et al.*, 1998).

In the 58-company cases analysed, we found a considerable number of changes in the dominant modes of UDI. Four cases went through three changes, six cases two changes and 11 cases one change in their dominant UDI mode. These changes were characterised by varying paths, lengths and contingencies. Five clusters of UDI change sequences emerged from this analysis (Table 4), which we discuss in the follow subsections.

Light UDI trials

The largest number of cases (22 in total) can aptly be characterised as *light UDI trials*, and include small or traditional trials with UDI, typically including some

Table 4. Company UDI change sequences by innovation process content.

UDI orientation	Description and focus	Changes	Cases
Light UDI trials: Companies seek compatible additions to their existing mode of operation	Trials in SU	None, i.e., remain in SU	Cell phone safety button, energy monitoring unit, smart news feed, user friendly apartments, transportation information display, online television recorder, GPS data collector, energy corporation user boards (8)
	Trials in UIFD	None, i.e., remain in UIFD	Electric plug, green labelling for offices, fabric store concept, dried berries, hardware store energy counselling, web security rating service, human centric wellness services, tea strainers, lightweight fireplace, energy efficient residential blocks (10)
	Trials combining UIFD and SU	UIFD–SU	LED lighting, online meeting organiser, speech-recognition service, additive-free meals (4)
Generification: A shift from more to less intensive user relations	Moving from initial user idea to serving a broader and more diverse customer base	UI–SU–UIFD	Nanocoating for skis, online swapping service, terrain golf game (3)
		UI–UIFD	Bathroom concept for assisted living, finance instrument for GSHP, baby clothing renting service, love locks, log carrying device (5)
	Moving from in-depth user collaboration or UCD to lighter engagement	DC–UCD–UIFD	Copper electricity harvesting (1)
		DC–UIFD	Elderly floor monitoring (1)
		UCD–SU	Interactive TV for seniors (1)
	UCD only	None, i.e., remain in UCD	Platform for distributed work, replumbing renovation concept, blood sugar monitoring system, playground for seniors, warehouse trucklifts, mobile tourist guide, insurance for teenagers (7)

Table 4. (*Continued*)

UDI orientation	Description and focus	Changes	Cases
	Swing to deeper collaboration and back after successful market launch	SU–DC–SU	Elderly wrist monitoring (1)
UI only	Innovations developed by users	None, i.e., remain in UI	Gluten-free pastry, dog leash, live video streaming system (3)
Deepening or in-depth collaboration	In depth user collaboration remains or becomes an integrated part of the company operation	UI–DC	Childbirth station, fishing equipment (Lindeman) (2)
		None, i.e., remain in DC	Dairy detergent and refill service, 3D skull X-ray, electronic health record, crowdsourcing platform for celiacs, park our playground (5)
		UCD–DC	Information system for kindergartens, elderly care software integration platform (2)
		UIFD–SU–UI–UCD	Social media platform for teenagers (1)
		UI–DC–UIFD–DC	Information system for diabetes patients, fishing equipment (Rapala) (2)
UDI becomes integrated in the company repertoire	Different UDI modes continue to be used in a large company	UIFD–SU–UIFD	Integrated elevator concept (1)
		UIFD–SU–UCD–UIFD	User friendly faucets (1)

non-mainstream market research (those remaining in SU) or small design empathy-dominated UDI trials in innovation projects (those remaining in user-inspiration for design, UIFD). The TVkaista online television recorder is an example of (the lighter end of) a light UDI trial (Example 1). As in the other cases, the trials contribute new design features, but do not fundamentally question or change the product or service offering of the company.

Example 1. The online television recorder as an example of a light UDI trial.

> TVkaista is an online recorder for programs from selected free television channels in Finland. Its recordings can be viewed on many different devices and also abroad. Initially, users could keep programs from the previous two weeks in a buffer and save selected programs in personal online storage for a longer period of time. When the service was redesigned in 2010, capacity emerged as an issue that required redesign. TVkaista used online surveying of its users' opinions about the features of the services, particularly to gain a better sense of balancing online storage and longer term storage. Based on the information gained, TVkaista renewed its concept by substituting the personal storage with a longer four-week buffer. Although the results and choices based on these results were of strategic importance to TVkaista, the user involvement method was light in its depth and did not question the role of TVkaista as product developer and service provider (*codes: SU, no changes*).

In light UDI trials, companies experiment with UDI, but do not integrate it into their product development process. From the SLTI perspective, the popularity of light trials is not surprising. Companies tend to have their extant ways of knowing the market in place and rather seek compatible additions to their mode of operation than seek to change the way their business is run (Williams *et al.*, 2005; Heiskanen and Repo, 2007).

Generification: A shift from more to less intensive user relations

In a large number of our cases that involved UDI modes requiring intensive relations with customers (such as UI or DC), we found that these intensive relations were not sustained after market launch, but turned to arms-length relations or were completely discontinued. Four different trajectories fall under our category of "generification", where particular user inputs were converted into generic commercial products (Pollock and Williams, 2008), hence rendering further user input redundant, or at least less important.

Within this category falls the second largest group of cases in which companies *shifted to a lighter UDI mode or withdrew from UDI* altogether at commercialisation and market launch. This can start off from any of the deep user involvement modes, and features several alternative change sequences. Before examining the sequences in closer detail, let us examine an example case starting from UI, namely how a UI developed nanocoating for cross-country skis (Example 2).

Example 2. Nano coating for skis, shifting to a lighter UDI mode.

> Many argues that cross-country skiing is enjoyable only when one's skis is in good condition. The coating of skis plays an important role here, as it requires skills to apply glide and kick wax to one's skis. Finnish innovator Matti Järvinen had years of skiing experience as well as extensive expertise in ski coatings. He trialled nanocoatings (*code*: UI), and as the coatings evolved he set out to investigate coatings that could make skiing more enjoyable for recreational, even occasional, skiers and children who have difficulties in servicing their skis. Järvinen prepared skis with various prototype coatings to be tested by regular skiers and asked for their feedback (*codes*: SU, first change). He wanted feedback from regular skiers rather than professionals, who are typically considered in the skiing industry. Once Järvinen's coating was finalised, he cooperated with ski manufacturing companies to prepare nanocoated skis for the market. In this phase, the manufacturers brought in their manufacturing expertise. Nanocoating is applied at the factory and the curve profile of nanoskis is lower than usual (*codes*: UIFD, second change). Within a few years, more than a half of the cross-country skis produced in Finland had nanocoatings.

Similar changes can be found in two cases starting off from DC, and one from UCD. Floor monitoring for the elderly described in case Vignette 1 is an example of the former.

The next subgroup emerges from a set of seven cases where "UCD only" engagement led to a product, after which further user input was deemed unnecessary. These appear to share the same background rationale of a successful product emerging and UDI being no longer needed — to our knowledge none of the cases continued UDI in the project or other projects in the company.

The case of elderly wrist monitor innovation is also included in this group, even though it features a more complex changes of first deepening DC and only then

diminishing (SU–DC–SU) because the product was generified after the necessary functionality was in place (Hyysalo, 2010). In total, the set of successful generification cases then results in 19 company innovation processes.

User innovation only

Successful generification finds its counterpart in the UI *only* orientation found in three out of 13 cases that start as UI. The UI mode appears to be sufficient when users act as entrepreneurs (Shah and Tripsas, 2007; Haefliger *et al.*, 2010). Only one of these cases, gluten-free pastries (Example 3), resulted in commercialised products, whilst a new dog leash and live video streaming remained to be used only by their inventors.

Example 3. Gluten free pastry, UI only.

> The CEO of the bakery Vuohelan herkku was diagnosed with coeliac disease, which encouraged this part-time bakery entrepreneur to modify her product range to a selection of gluten free pastries (*code*: UI). According to the CEO, this made sense, because the Finnish market was lacking appealing gluten free bakery products. Therefore, she started to develop new recipes with an aim to beat the competitors' products on taste and consistency. Coeliac consumers found the Vuohelan herkku products quickly and liked them, which made the business grow in a decade from a one-person enterprise to an employer of approximately 40 people.

Our data include only few cases of such UI and the data are merely suggestive concerning this category of cases. However, it makes sense to argue that UI in and of itself appears insufficient for many companies in the creation of commercial market offerings, unless they have a very specific niche market in mind (as exemplified by the example above).

Deepening or sustained in-depth collaboration

A significant company strategy represented by 12 cases falls under *deepening or in-depth collaboration* in the course of innovation. This cluster of cases includes six business-to-business as well as six business-to-consumer cases, of which five consist of young firms and seven of established firms. Whilst the exact changes differed, they all ended in intense DC and their preceding modes feature a tendency to move towards deeper collaboration. In social shaping of technology terms, the UDI becomes part of the company's sociotechnical constitution, a

pervasive part of how it operates in its development and marketing activities (Williams and Edge, 1996; Russell and Williams, 2002). Companies adhering to this strategy also rely on their designers' competences. Let us examine such a change sequence with multiple strategies through Rapala's fishing equipment case (Example 4).

Example 4. Fishing tackle, deepening and in-depth collaboration.

> Rapala originates in fisherman Lauri Rapala's innovations in fishing tackle and products that then followed in lure fishing (*code*: UI). The company focus is on amateur use of lures and Rapala enhances users' cultures of amateur fishing. However, the market is global and the company has to offer a variety of lures for different use environments. Rapala has collaborated with fishing guides and professional fishermen to keep renewing its lure development. The company also has a systematic process to collect and develop diverse ideas from fishermen (*code*: DC). It also uses its designers' expertise heavily in the process: No new tackle is rushed to market, but new products are crafted from years of experience. A wide range of technical tests are also conducted and all Rapala lures are designed and tested to swim perfectly right out of the box. Social media is used as an important arena for teaching fishing skills (*code*: UIFD). The amateur and professional users continue to play a role in Rapala's new lure development, playing key roles in many development projects, whilst others are more in-house dominated (*code*: DC).

The cases that feature deepening or in-depth collaboration include several different change paths. They may evolve from UI to DC, continue as extensive and sustained DC, involve a shift from UCD to DC, or entail several consecutive changes, as in the fishing tackle example described above. In the cases we analysed, there was no one driver explaining the deepening collaboration but rather it happened as a gradual response to opportunities the collaboration presented and the relative lack of factors impeding it.

UDI is integrated in the company *repertoire*

The final group relates to in-depth collaboration becoming part of the company *repertoire*. Both cases include established companies where in-depth UDI projects, sometimes collaborative projects with academia, have become a legitimate part of corporate *repertoire* albeit amidst other ways of working in their R&D. Such

wider, sometimes complementary but occasionally also competing arrays of user relation methods are also commonly found in previous studies (Johnson *et al.*, 2014). Let us examine the Oras faucet case.

Example 5. Faucets, UDI as part of company *repertoire*.

At Oras, a faucet manufacturer for 80 years, the needs of customers and design have always been an integral part of product development. Oras has emphasised user oriented design throughout its lifespan. The creation of a new product starts by identifying a user need, which the company designers then build their designs on (*code*: UIFD). Oras also has a large *repertoire* of ways of working with users to probe markets and for creating usability that goes beyond the standard (*code*: SU). Whilst some of these studies, often academic collaborations, dig deep into people's everyday life as grounding for design (*code*: UCD), UIFD has remained the predominant mode of engagement in the company for making faucets easier, safer and more ecological than before.

Controlling the findings for data longevity

As noted, the studied set of 58 cases include both long-term and short-term cases, the former spanning over several product launches. The concept of dominant mode in user engagement allows us to juxtapose short-term and long-term cases. Two control questions emerge in terms of longevity: First, to what extent do changes occur in the short-term cases (i.e., within one product launch)? Second, do more changes in dominant mode occur in cases with long-term data than in cases with short-term data?

Let us first examine the 10 cases on which we have long-term data. Of these, four cases go through three changes in their dominant mode of user engagement — and account for all cases with three changes in our set of 58 cases. Two additional long-term cases go through two changes, representing one third of the cases with two changes. Another three go through one change. Only one stayed in the initial mode and represents DC, a mode that indicates in-depth information exchange between developers and users. UDI has not been abandoned in any of the long-term cases, but this could partly be an artefact of data gathering in that long-term follow-up does not tend to continue unless something interesting happens in the company.

We can also examine this relationship in cases that were only followed up until one product launch. There are four such cases with two changes in their dominant mode, i.e., two-thirds of two mode changes take place in the cases that only cover one project. From this, we can infer that some changes in dominant UDI mode take place even within cases that cover only short-term singular product launches, but

the propensity to shift increases with time. With the caveat of the non-continuation of data collection, we can infer that the propensity of mode changes in the 58-case data-set would be subject to increase with the continuation of data gathering. Hence, the overall number of changes presented in the current analysis are likely to downplay the prevalence of changes in the dominant UDI mode in companies.

Discussion

Diversity is evident in the modes of UDI practiced in companies. Roughly half of the Finnish UDI showcases started out with a light mode of user involvement (UIFD or SU) and in half the company has taken user engagement to a level where it cannot remain as a simple add-on to their business as usual practices. Furthermore, about 40% of the Finnish UDI cases and 90% of cases with detailed long-term data featured a change in the dominant mode of UDI during the period analysed. These findings suggests that UDI is in indeed an umbrella term, but the modes of involving users within that umbrella are related to one another in company practice.

First, these findings point to the different implications of UDI modes for companies: For instance, how much control the company retains, how much it has to invest and how easy it is to commercialise the information gained. UCD and SU — two modes, in which users are studied to inform design — appear to produce outcomes that companies do not seek to complement with another UDI mode. A possible explanation is the strong control and ownership of the information produced through these two modes. Indeed, turning to UIs, which entails giving a way control is not — at least not yet, in this data-set — a strategy that companies would seek if they are already operating with another mode of UDI.

Second, that companies often used two or more modes is, we believe, an indication that what works for a company and its users in a situation need not work in another situation. Companies may not be advocates of this or that mode of UDI, let alone a particular method, *per se* (unlike many academics), but rather appear to navigate and improvise their modes of engagement with users amidst other priorities in their development activities (cf. Janssen and Dankbaar, 2010; Johnson *et al.*, 2010).

Third the findings help contextualise some recurring ideas found in different corners of the academic research related to UDI. Let us start with the idea of increasing maturity in user engagement, finding its clearest expression in usability maturity models (Earthy *et al.*, 2001; Kuutti *et al.*, 1998). We find seven cases where engagement with users led to further deepening and in-depth DC

becoming the final mode of operation, together with the five cases remaining in that mode from the outset. This represents one-fifth of all cases, and within them there are five different change sequences. Maturing, hence, does not always take place nor does it appear to follow clearly defined steps — it does not appear as a uniform, directed process. Accordingly, further research is called for on how the maturation of UDI in companies actually takes place, and why it might not occur and what are most apt maturity levels in different contexts (Enkel *et al.*, 2011).

The other side of the maturity issue is that many companies see SU and UIFD as sufficient user engagement. It appears that policy makers' hopes for promoting user driven corporate cultures via light experimentation are hopeful at best, and hence, unlikely to achieve the kind of results that public funding programs seem to target.

Another common idea is that an innovating user would provide companies the user domain knowledge needed to innovate (von Hippel, 2005; Peine and Herrmann, 2012). Judged by 15 cases that start as UIs in our data-set, this rings true for domain knowledge needed to invent the product or service concept. However, when examined through to market entry, only one case with only an initial user innovator proved successful. In 12 other cases, another mode became dominant and in two others, the UI was not commercialised. These patterns may point to impediments and the disincentives that constrain innovating users (von Hippel and DeMonaco, 2013) but also to a discrepancy between lead user solutions (and lead users domain knowledge) and the solutions preferred by rest of the market and the related mainstream user domain information (von Hippel, 1988).

Implications for Management of and Policy for User Driven Innovation

Examining real life UDI cases lends support to the intuition that UDI is a multi-faceted phenomenon. But not only that, it is one that changes its shape in the course of company practices. This implies a shift away from the currently popular short-term projects to introduce new methods or ways of working in the company, often championed by consultants or researchers. Instead, efforts should go into determining what would be the most apt UDI modes for the given company and its current and potential clientele, and into sustained interchange to refine these further. The move could be characterised as a shift from "tactical" engagement with UDI ("what could we do with UDI") to increasingly "strategic" engagement ("what would be the most apt way to benefit from UDI"). This would entail a shift in what is being targeted and given (corporate and/or public) support: Not seeking

to refine any one of the modes as such, but to refine UDI practices within companies.

This does not, however, imply merely providing resources to companies and letting them sort issues out. Most companies do not have the competences to assess, refine and implement adequate UDI measures successfully on their own. In our interviews, the case companies found it easy to communicate their innovation processes and their engagements with users, but found it difficult to consider what other modes of engagement they might trial, or indeed, what might be the best suited candidates. Consultations that would open options and assess the aptness of different means for the company's information needs would be welcome.

The utilisation of DC and UCD tend to require slow learning processes within the company in order to become successfully incorporated in pre-existing corporate routines and practices (Hasu, 2001; Hyysalo, 2009a; Heiskanen *et al.*, 2010). The time span and new competences needed are in such cases considerable and should be reflected in support measures.

Thus in the light of our findings, recent UDI programs in European countries may not have paid sufficient attention to the longevity of UDI (Timonen and Repo, 2014; Repo *et al.*, 2013). For instance, in Denmark, the bulk of UDI support has gone to design consultants and researchers, resulting in many trials and new openings but few long-term development projects with industry (FORA, 2009; Elgaard Jensen, 2013). In Finland, funding was spent on academic research projects or handed directly to companies, neither of which seems to have been optimal in facilitating long-term strategic engagement with UDI. Dealing with the diversity in how UDI mode changes take place in companies, thus, presents a research and policy area that merits further attention.

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Appendix A

Table A.1 Characteristics of analyzed UDI cases.

Innovation project	Company/organisation	Sector	Small company < 50 staff	Medium sized company	Large company	B2B	B2C	Product	Service	Systematic offering	New offering to the company	Improved offering	Not on the market yet	Long term data
3D skull X-ray	Planmeca	Health technology		×		×		×	×	×	×			
Additives-free meals	Fazer Food Service	Hospitality			×		×		×			×		
Baby clothes renting service	Belbamboo	Clothing	×			×	×	×	×		×			
Bathroom concept for assisted living	Väinö Korpinen	Health technology		×		×	×	×			×			×
Blood sugar monitoring system	Modz	Health technology	×			×	×	×			×		×	
Cell Phone safety button	Mobile Care Safety	Safety technology/ICT	×				×	×			×			
Childbirth station	Relaxbirth	Health technology	×			×		×	×		×			
Copper electricity harvesting	Outotec	Mining and minerals			×	×		×	×			×		
Crowdsourcing platform for celiacs	Moilas Leipomo	Grocery	×				×	×				×		
Dairy detergent and refill service	Kill to Clean	Detergents		×		×		×	×		×			×
Integrated dual dog leash	(Company Commercialization halted)	Pet Products	×				×	×			×		×	
Berry health snacks	Biokia	Groceries	×				×	×			×			
Elderly care software integration platform	Wiktio	ICT	×			×		×	×	×	×			
Elderly floor monitoring	Elsi Technologies	Health tecnology	×			×		×	×	×	×			×
Elderly wrist monitoring	Vivago	Health technology	×			×	×	×		×	×			×
Electric plug installation system	Revolte	Construction	×			×		×			×			

Table A.1 (*Continued*)

Innovation project	Company/organisation	Sector	Small company < 50 staff	Medium sized company	Large company	B2B	B2C	Product	Service	Systematic offering	New offering to the company	Improved offering	Not on the market yet	Long term data
Electronic health record	Logica	ICT			×	×		×		×		×		
Energy corporation user boards	Fortum	Energy			×		×		×		×			
Energy efficient residential block	Sitra, SRV&VVO	Construction			×	×	×	×		×	×		×	
Energy monitoring unit	Enoro	Energy			×	×	×	×	×		×			
Fabric store concept	Eurokangas	Fabric retail		×			×	×				×		
Finance Instrument for heat pumps	Helmi säästöpankki	Finance			×		×		×		×			
Fishing nets	Lindeman	Fishing equipment	×			×	×	×			×			×
Fishing tackles	Rapala	Fishing equipment		×		×	×	×			×			×
Gluten free pastry	Vuohela bakery	Grocery	×				×	×				×		×
GPS data collector	Pajat Solutions	ICT/Mobile phone app	×			×		×			×			
Green labelling for offices	WWF	Non-governmental organisation		×		×			×		×			
Hardware store energy counseling	K-rauta	Hardware retail			×		×		×		×			
Human-centric wellness services	Create Amove	Wellness services	×				×		×		×			
Information system for diabetes patients	ProWellness	Information systems	×			×		×			×			×
Information system for kindergartens	WhileOnTheMove	Information systems	×			×		×			×			
Insurance for teenagers	Tapiola	Insurance			×		×		×		×			
Integrated elevator concept	Kone	Elevators			×	×		×	×	×	×			
Interactive TV for seniors	City of Espoo, Laurea and Videra	ICT/Elderly care		×		×	×		×		×		×	
LED lighting	MTG-Meltron	Lighting	×			×		×			×			
Lightweight fireplace	Nunnauuni	Fireplace	×				×	×			×			
Live video streaming system	Academica	ICT/Streaming	×			×	×		×		×			

(*Continued*)

Table A.1 (*Continued*)

Innovation project	Company/organisation	Sector	Small company < 50 staff	Medium sized company	Large company	B2B	B2C	Product	Service	Systematic offering	New offering to the company	Improved offering	Not on the market yet	Long term data
Log carrying device	Arvemet	Household appliances	×				×	×			×			
Love locks	Tukku Immonen	Household appliances	×				×	×			×			
Mobile tourist guide	see Finland	ICT/Tourism	×				×	×			×			
Nano coating for skis	Matti Järvinen sport	Sports Equipment	×			×		×			×			
Online meeting organiser	Dicole	Digital service	×			×			×		×			
Online swapping service	Netcycler	Digital service	×				×		×		×			
Online television recorder	TV Kaista	Digital media	×				×		×			×		
Parkour playground	Lappset	Playground equipment		×			×	×			×			
Platform for distributed work	Microtask	ICT	×			×			×		×			
Playground for seniors	Lappset	Playground equipment		×			×	×			×			
Replumbing renovation concept	Vahanen	Engineering			×	×			×	×		×		
Smart news feed	Leiid	Digital service	×				×	×			×			
Social media platform for teenagers	Sulake	Digital service/Social media		×			×		×	×	×			×
Speech recognition service	Suomen Puheentunnistus	Speech recognition	×			×		×			×			
Teastrainers	Paulilna Rundgren Handicrafts	Handicraft	×				×	×			×			
Terrain golf game	Solo-international	Sports equipment	×				×	×			×			
Transportation information display	Destia	Transportation			×		×	×			×			
User-friendly apartments	SRV	Construction			×		×	×				×		
User-friendly faucets	Oras	Sanitary fittings		×		×	×	×			×			×
Warehouse trucklifts	Roda	Industrial trucks		×		×		×			×			
Web security rating service	Web of Trust	Digital service	×				×		×		×			

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