

# Knowledge Management-in-action in an EUD-oriented Software Enterprise

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**Abstract:** End User Development (EUD) aims at the enabling of end users to adapt, modify or extend software and has become an important keyword for software designers. Discussing premises for the success of EUD, several authors have stated that processes of knowledge development and diffusion play an important role. Current research discusses such Knowledge-Management issues mostly in the client organization. But if we want to bring an End User perspective into design practice, we have to take into account how producers manage their customer-related knowledge and bring it into action. Therefore, the study presented here describes the results of a related *Business Ethnography*, which was carried out in a small enterprise of the German software branch. The paper explains how this ethnographic action research helped to identify practices, potentials and problems in the enterprise to acquire, secure and use knowledge about the end users of its products. Preliminary findings demonstrate that EUD is not only a technical, but also a Knowledge-Management challenge for software enterprises.

## 1. Introduction

In software design, End User Development (EUD) has become an established conception aiming at the enabling of end users to adapt, modify or extend software artefacts (Lieberman et al. 2006). EUD has become the focus of an EU-funded Network-of-Excellence (EUD-Net) and a well-known keyword, for example, in IEEE - the same way as Knowledge Management (KM) had become before. Further than that, both concepts do not seem to have much in common at first glance. EUD generally is associated with software design, while Knowledge Management is associated with information systems and organizational development. But appearances may be deceiving, as there are important links between EUD and KM:

information systems can be designed for EUD, and EUD-oriented software development may call for KM in the client organization (Mackay 1990; Nardi and Miller 1992; Kahler 2001; Pipek 2005). Thirdly, knowledge and its management can play a crucial role in the customer-producer relationship (Fischer and Giaccardi 2006; Stevens and Draxler 2006; Stevens et al. 2007).

Although “for most design problems, the knowledge to understand, frame, and solve problems is not given, but is constructed and evolves during the problem-solving process” (Fischer and Giaccardi 2006, p.428), this third perspective on EUD and KM has remained under-investigated. It relates to possible strategies of EUD-oriented software enterprises to acquire, evaluate and secure knowledge of users of the targeted markets within their everyday operation. As the producer-customer relationship is partly mediated by technology (cf. Stevens and Draxler 2006; Stevens et al. 2007), its relationship with opportunities for Knowledge Management-in-action is an important question.

The application of Business Ethnography (BE) (Nett & Stevens 2008) for research on this relationship in a supplier organization is the focus of this paper.

The paper is structured as follows: after an introduction into the fields of EUD and KM, the methodological background of our research is described and positioned as BE. Following, the application of BE is explained. Closing the paper, the role of organizational learning for practical success of KM and EUD are discussed, as well as BE as a resource to study it.

## **2. Knowledge Management and End User Development**

KM evolved as a discourse in the context of emerging new information technology, partly envisioning related opportunities of the Knowledge Society. Davenport and Prusak (1998) concluded that KM could not prevail if it reduced knowledge right from the start, i.e., by applying a managerial, individual or merely technology-oriented perspective, and hinted at the necessity to embed KM in organizations instead. From this point of view, KM is not only about technical information systems, but on the interplay of technology and knowledge practices in organizations.

Conceptions such as KM and EUD are often described as plausible models (of knowledge use on the one hand, of design conceptions on the other). However, real-world actors, i.e. enterprises, can benefit from such general conceptions only if they develop strategies to contextualize them.

In particular, small enterprises hesitate to invest into KM, which they regard as comprising expensive technology accessible only for large enterprises (Nett & Wulf 2005). Hence, it is important to study if and how small enterprises learn in the action of operation about their products and their importance for the users on the one hand, and how they can bring knowledge on user demands, user habits and user competences into action again, on the other.

Research on “in-action” perspectives of KM in small enterprises, therefore, is of major interest. The study described in this paper is part of a public funded project called CoEUD. In this project a group of small and medium-sized software firms collaborate to develop more EUD-oriented products. The SME character of the enterprises in the CoEUD project is not untypical for the German software branch, where the average size of the enterprises is very small (Friedewald et al. 2001).

EUD has become a new focus for software design: when Henderson & Kyng (1991) identified tailoring of artefacts as a different activity from normal use, a large transition gulf could be identified between using and tailoring and between superficial and deep tailoring (MacLean et al. 1990; Bentley & Dourish 1995), where the latter involves changes of the system architecture and functionality. The complexity of customization was identified as a problem for end users (Mørch 1997), and the reduction of system complexity as the necessary solution (Myers et al. 2003; Fischer et al. 2004).

Some EUD-researchers investigated into real-world problems of users. Their work has been based on qualitative research, mostly ethnographic studies (Dourish et al. 1999). This kind of research demonstrates that knowledge development and knowledge diffusion are important for EUD. Obstacles to the exploit of technological options within organizations were systematically examined by Mackay (1991), Gantt & Nardi (1992) and Wulf (1999), positive impacts of related networks by Mackay (1990). Possible productive roles for local "gurus" and developers were analyzed as a part of “tailoring cultures” and group tailorability (Kahler 2001; Pipek & Kahler 2005).

Pipek (2005) argues that EUD research falls short if it only concentrates on artefacts. In relation to other EUD research, his argument shows a shift in perspective: whereas “human factors” had been mostly studied as a source of problems hindering users to benefit from a (supposedly fully transparent) possible use of a given artefact, his perspective now was how to make the social embeddedness of technology a benefit for the user.

It is not necessarily the intention of its developer, which makes an artefact a KM system, but its functioning as support for an organizational context. This perspective allows (but also needs) to study technological infrastructures in their functioning, this is: “in action”.

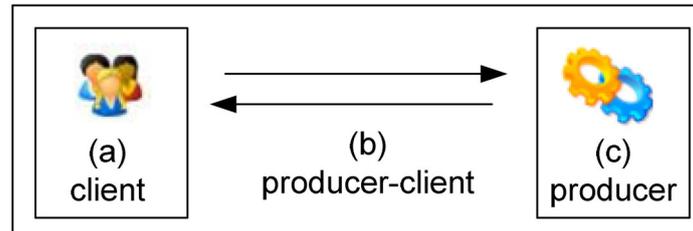


Fig. 1.. EUD related research on Knowledge Management-in-action

Reflecting on the relevant foci, research can be differentiated into three categories (cf. Figure 1):

- (a) Research on EUD related knowledge processes on the client organization
- (b) Research on EUD related inter-organisational KM infrastructure
- (c) Research on EUD related knowledge processes the producer organization

The first category mainly focuses on Knowledge-Management systems in client organizations and covers most studies, in particular, the recent ethnographical ones. EUD-oriented KM systems like infrastructures for user communities (Pipek 2005) mainly target at the client side, too. Category b) addresses the aspect that EUD have to integrate inter-organisational Knowledge Management infrastructure. Fischer, for instance, drawing on his previous work on End-User Modification (Fischer & Girgensohn 1990), developed the concept of Meta-Design (cf.: Fischer & Giaccardi 2006). The general idea is that new products are not enough to establish sustainable EUD, but that it also needs production innovation. Fischer suggests an iterative model which he calls the Seeding – Growing – Reseeding (SER). This has consequences for the role of designers and users: “The SER model encourages designers to conceptualize their activity as meta-design, thereby supporting users as designers in their own right, rather than restricting them to being passive consumers.” (Fischer & Giaccardi 2006, p.428).

The work of Stevens et al. (2007) addresses the question how to bridge production-related KM processes and appropriation-related practices, i.e. by the technical means of so-called “appropriation infrastructures”. However, according to Fischer’s focus on iterative improvement on the basis of learning from practice, design of such products had to be guided by learning-by-doing, too. In this regard, they are as much a framework to organize customer-producer interaction supporting EUD, as they open up problems for KM, setting questions on the agenda like:

- In how far does the communication and cooperation infrastructure between a software enterprise and its customers support the appropriation of the software products?

- How can an enterprise learn “in action” how to make the functioning of its communication and cooperation infrastructure with the customer more supporting for the appropriation of its products?

Research conceptions tackling these questions falling into category c), studying the EUD related knowledge processes in a producer organisation from the insider perspective. In particular such researches have to function in real-time operation, focus on learning processes, and cover on technology and organizational change, as well.

In the following section, Business Ethnography (BE) will be described as the related research design of our study.

### 3. Methodology

Business Ethnography (BE) was originally developed as the empirical part of the action-research oriented design conception of Integrated Organization and Technology Development (OTD) (Wulf et al. 1995, 1999). OTD is a process model to support a technology expert in his efforts to identify and tailor technology dedicated to help a client’s self-organization instead of replacing it technologically. Related projects were based on a set of workshops, in which researchers and organization members took part to analyze and define requirements or to discuss design alternatives (cf. Rohde, 2006). BE, initially only the empirical part of OTD, informed the technical expert about the status quo in the given setting.

It is framed by the action research-oriented context of OTD. This implies that BE is conceptualized as a visible intervention into the field established by the cooperation of the project partners.

The qualitative research undertaken, therefore, originally was based more on interviews than on own field observations. This did not only help the ethnographers to understand the given situation and possible boundary objects (Bowker & Star 1999), but additionally helped them to establish Social Capital (Ackerman et al. 2004) between the actors in the project and supporting experts (Nett et al. 2006).

The goal of BE is to understand everyday work practices in a particular context. One of the most important elements of BE is the central role of interviews with project partners on their cooperation practices, which form the basis of analyses. The interviews not only give insights into the distributed, sometimes even contradictory character of the organizational model(s) guiding the actors, but also uncover deviations from “normality”, either perceived by the interviewees or deduced by the interviewer from analyses of the perspectives and experiences of different actors.

BE differentiates between formal organizations, on one hand, and practices and routines underlying them, on the other. It thus focuses on differentiations between

routines, disturbances and normative aspects in everyday-work practices. BE aims at the actors' perception of the situation in the field, but helps to produce a new picture, at the same time: an integral part of the BE is to confront the project partner with the analyses of the interviews with them, and ask them to comment.

The reason for that is two-folded. First this is a common method in action research to validate the analyses, which is adapted in BE. Secondly, this strategy is used to allow for self-organized learning processes: the feedback confronts the interviewees with a perception of their situation that has undergone a methodological interpretation by the ethnographers and thus is perceived by the interviewees as an expropriation of the experience that they expressed. This 'ex-propritation' allows the project to evaluate perceptions and expectations of the project partners on a related workshop from a distant position, and thus for their discursive 're-' and 'a-propritation'.

BE thus also offers data for analyses of learning processes. It is combined with common discussions of the interview partners about the validity of the interpretation, its impact for the understanding of the given situation and for the common project, as well.

This social process increases the distancing effect of the expropriation/ appropriation loop of BE in regard of the experiences of the interviewees fostering knowledge development. As a compound of action research and ethnography, BE has been applied in several projects, in which the ethnographer cooperated with the project partners to achieve common project aims. Organizing an expropriation/ re-appropriation loop of related knowledge with the project partners helps them to reflect on their local expertise and develop new strategies.

The application of BE in the case presented here shows two major differences compared to its role in an OTD process: first, in the given case, research had to be carried out not in a client organization with its specific technology demands, but in a producer organization, which had to address its market. Secondly, OTD normally searches for technological solutions, whereas in the presented case the task was to find organizational solutions to support a specific technological approach. Therefore, research could not apply OTD, but draw on BE. In the following, we present our process of conducting BE.

#### **4. Proceeding**

In order to study how small enterprises can gain and use their knowledge about end users to develop more EUD-oriented software projects, we contacted the CEO of a project partner. His enterprise works in the fields of learning products, CMS and e-Commerce and occupies seven employees with fix contracts and a network of free lancers. The study was conducted from September to December 2007, mainly based on 10 interviews of one hour of duration each. All were conducted

on-site at the company, except for one, which consisted of a telephone interview with an employee in Brussels.

Interviews were recorded, transcribed, paraphrased and analyzed. In the study it was possible to interview all employees with a fix contract: the CEO of the enterprise, the CIO, one apprentice of IT-technology, two marketing employees, one additional technician and one designer. Additional interviews were conducted with one former marketing employee, as well as with one designer and one development freelancer, both of them with a long record of contracts with the company.

All interviews were based on a semi-structured guideline, which contained questions on the role, tasks and responsibility of the interviewees in the enterprise. Further questions were asked about processes and communication media in the context of possible knowledge on or contact to the clients. Interviews left room to answer according to an own relevance-system. Interviewees generally started answering according to formal processes and responsibilities.

Disturbances and specific work practices were seldom autonomously addressed by the interviewees themselves. But when asked about possible differences to normal product development processes, interviewees started to talk also about problems and extraordinary experiences within their daily work. Analyses were thus based on the differentiation between formal processes and informal practices. They started with the modelling of the formal organization of processes, which could be reconstructed by combining interviews. This could be made the basis to identify irregular situations. The results of the related analysis was presented and discussed with the interviewees on a workshop after analysis, allowing the correction of wrong interpretations by the interviewees themselves.

## 5. Preliminary Findings

A fundamental aspect of the EUD-oriented Meta-Design conception (Fischer, 1999) is that related KM should include the design of the customer-producer relationship. However, our preliminary findings indicate that for an SME, KM is difficult to be established. For example, the CEO, in the preliminary discussion preparing our study, explained how the enterprise lacked of customer feedback. In contrast, one of our surprising findings was that there was a lot of customer feedback, but obviously a fundamental problem to systematically make use of it. In opposition to the Fischer model, in most cases the first initiative for a user-designer communication was not coming from a designer but from a user. Alterations of the formal model and innovations were often only developed in reaction to such unanticipated user behaviour.

Although the producer did not offer the users “proper” feedback channels, users still responded to an astoundingly large extend by a creatively “mis-“ using of the registration form. Users not only addressed problems to apply the product, but also made suggestions and proposals.

It is striking that some suggestions are used by the company as impulses for product development, but did not become organizationally aware, as there was no in-house discussion on user activities and their potential innovation. Based on this observation, we conclude that the main problem was not the lack of customer feed-back in general, but the problem of interpreting and managing it. In given cases, some reactions had been taken, but not systematically exploited. This shows that, if we want to bring EUD-oriented concepts like Meta Design into practice, we also have to develop EUD-oriented KM-in-action. Consequently, we have to study the situation in more detail. Our related findings yet remain only the first tentative ones.

Our interviews as well as the group discussion on the workshop showed that the CEO and the CIO very much dominated the discussion, indicating that even in this very small enterprise, there can be a strong hierarchy and a centralization of decision making. This obviously was partly in contrast to the de-central creation of knowledge during operation. The organization thus was neither a Tayloristic one, nor one of flat hierarchies.

This may explain why even the CEO was impressed by the approaches developed in his enterprise to benefit from unanticipated information about the customer, and how he could be astonished by the opportunities becoming apparent, when these approaches were connected to one whole picture in our presentation: *“this really shows a consistent philosophy to follow”*, he remarked after our presentation in obvious surprise. This is in line with the finding of Davenport & Prusak's (1998), that it makes a difference to develop an innovative product and to develop an innovative development environment enabling the development of innovative products, and that the opportunities to share knowledge are the crucial prerequisite for the latter.

Discussing this point with the workshop members, a further workshop was decided upon to improve opportunities to exploit customer feedback by improving inner-organizational knowledge exchange. This workshop has not yet taken place, but we plan to further investigate into the opportunities and problems of this situated form of Knowledge Management-in-action.

## 6. Conclusion

Preliminary findings coming from using Business Ethnography to study Knowledge Management-in-action in a small enterprise demonstrate that EUD is not only a technical, but an organizational challenge, where Knowledge Management-in-action plays a critical role. This has often been ignored in literature on EUD, which has been interested in knowledge processes only at the client side. Generalizing our finding, there is too little awareness for client-oriented KM in producer organizations as a part of an EUD strategy. In our case, EUD was a motivation for the enterprise to participate in a related project and understood as a marketing ar-

gument, but had neither been reflected in the organization as a challenge nor as a basis for Knowledge Management-in-action.

This lasting lack of interest from both academia and industry could be seen as an argument against any importance of research or conceptions on the relationship between EUD and KM in producer organizations. However, our BE demonstrated that investigating into related opportunities made quite a handful of interesting approaches and related potential in the enterprise visible. However, these were neither reflected nor exploited systematically, due to a lack of knowledge sharing. This shows that BE, while requiring further elaboration as a conception for reflexive organizational learning to combine KM-in-action and EUD, can be of great benefit to orient software enterprises on sustainable EUD.

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