

# **Knowledge Maturing at Workplaces of Knowledge Workers: Results of an Ethnographically Informed Study**

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**Abstract:** The concept of knowledge worker has been around for fifty years and many information and communication technologies have been implemented in order to support this type of work. Workplaces have changed substantially, but information is scarce about how actual knowledge workers handle knowledge in their workplaces. This paper presents the results of a joint study of knowledge workers' workplaces in five organisations representing a diverse sample in terms of size, sector and technology intensity. The results suggest that a number of person types with predominant ways of handling knowledge can be favourably used for designing supportive tools and infrastructures.

**Keywords:** ethnography, knowledge management, knowledge work, persona

**Categories:** L.2.1, L.2.2, L.3.4, L.3.8, M.4

## **1 Introduction**

The concept of knowledge work(er) celebrates its 50th anniversary this year [Drucker, 1959; Kelloway, 2000; Hayes, 2001; Schultze, 2003] and there are information and communication technologies (ICTs) in abundance to support the handling of

knowledge, informal or workplace learning. One can assume that there have been large changes in workplace organisation due to increasing penetration with ICTs. However, there is a notable shortage of studies that analyse what is going on in organisations in terms of workplace learning and how guidance of these collaborative knowledge and learning activities could be designed. Furthermore, empirical data about maturing of knowledge within organisational settings cannot be found in the literature. This paper presents the results of a collaborative ethnographically informed study which investigated workplaces of knowledge workers from a knowledge (maturing) perspective. In the following, the paper first gives an overview of the procedure taken in the study and the analysis of its results. Section 3 presents individual studies and selected results, specifically so-called personas and cases that are described from a knowledge maturing perspective. Section 4 then reports on the procedure we took to consolidate the results found in the individual studies as well as its outcome. Finally, section 5 concludes the paper and gives an outlook to the studies' further (potential) usage.

## 2 Procedure

Ethnographical research established in anthropology and social science was developed to investigate new cultures and social settings. The key characteristic of ethnography is active participation in social settings to understand why things happen [Jordan, 1996; Fetterman, 1999; Lamnek, 2005]. In contrast to field observation which describes what happens, ethnography focuses also on the why and how things happen. The researcher tries to become a member of the community by working with people in their natural environments, typically for long periods of time [Fetterman, 1999]. Recently, ethnography has become more popular also in disciplines other than anthropology and sociology. For example in computer science, ethnography has been one of the key approaches for designing CSCW (computer supported cooperative work) systems [Harper, 2000]. In order to balance the need for an in-depth understanding of why, how and in what ways technology affects work practices in the fast-changing world of information systems which calls for ethnographic studies with the substantial efforts and time that this type of empirical work requires, modified versions, like rapid ethnography [Millen, 2000], have been proposed to be more suitable in requirements analysis [Harper, 2000]. The main idea of that modified ethnography is to save time by narrowing the focus, use several observation techniques, work collaboratively and use tools for the analysis [Millen, 2000].

The term collaborative ethnographically informed study might fit better to our study because we performed five studies with joint perspective and guidance adhering to ethnographic fieldwork as much as possible. The time allocated had to be limited to four weeks each, though, and divided as follows:

*1st week:* At least two researchers visited each organisation to undertake the ethnographic fieldwork and to gain an understanding of knowledge maturing.

*2nd-3rd week:* Ethnographers were in contact, e.g., via e-Mail, instant messaging or telephone, with participating knowledge workers. Self-reporting was used for gaining data about specific and well-defined topics over the two week period.

*4th week:* The same researchers returned to the organisation for further ethnographic fieldwork. They discussed the topics of self-reporting, gained a richer picture of organisational activities and interview selected individuals.

This fieldwork provided us with rich qualitative empirical material which was coded, reflected and analysed. Numerous face-to-face workshops and teleconferences were held with the ethnographic teams in order to jointly interpret the data. A number of distinctive results were found, specifically knowledge maturing routines, cases, processes as well as personas.

Modelling personas is one promising approach to characterise user needs, work routines and learning styles as proposed by [Cooper, 1999]. A persona is a precise description of a user's characteristics and what he/she wants to accomplish [Cooper, 1999] and represents a class of target users that is described with rich information [Aoyama, 2007]. Besides its usage for software designers, personas can be used for communication with clients and stakeholders [Chang, 2008]. There is a plethora of related work investigating personality types from a psychological perspective [Bayne, 2004; Bayne, 2005; Bayne, 2006]. However, general personality types have not been analysed from a learning perspective and, thus, do not focus on how individuals handle knowledge (maturing), which was the main research interest for the ethnographically informed studies. Personas form important communication media within the team of designers [Blomquist, 2002]. They are useful in helping to guide decisions about a product, such as features, interactions, and visual design.

### **3 Results of Individual Studies**

This section provides an overview of results of the ethnographically informed studies conducted at six organisations selected for diversity in terms of size, sector and technology intensity (names of organisations are pseudonyms). Table 1 provides an overview of the organisations studied.

organisation	size	sector	country	# ethnographers	identified personas
IT Service Provider	large (400 employees)	IT services	Germany	3	Aisha Igor Sally
Health Care Training and Consulting	large (4,000 employees)	health care	Germany	3	Otto Silke
Tele-communication Provider	large (20,000 employees)	tele-communication	Switzerland	2	Kurt Thomas
IT Franchising	medium (130 employees)	IT	Germany	2	Axel Heather Kevin Stella
Careers Guidance Services I	large (> 300 employees)	professional services	United Kingdom	3	Edward Fiona Gina Harry
Careers Guidance Services II	large (>1,000 employees)	professional services	United Kingdom	4	Andrew Becky Colin Deborah
e-learning and consulting services	small (30 employees)	consulting services	Spain	1	Carolina Raquel

*Table 1: Studied organisations*

Each of the following sections contains a short description of the observed organisation as well as a summary of collected results and presents two selected outcomes: (1) one persona developed to represent ‘typical’ employees; and (2) a selected description of short-term, individual, and situational as well as long-term, more procedural knowledge maturing cases involving many organisational members or even units.

### 3.1 Study I: IT Service Provider (ITSP)

ITSP is specialised on SAP solutions for utility companies and employs 400 staff. ITSP operates a computing centre, is an outsourcing provider and has administration/hosting, consultancy, development and application support teams. Nine employees were studied by three ethnographers who aggregated characteristics of several knowledge workers and created three personas: Aisha, the anchorwoman; Igor, the communicative type and Sally, the do-it yourself type (names again are pseudonyms).

Igor, a persona which represents a communicative type could be identified and based on real-world individuals working as technical consultants directly with customers. Igor works as an IT consultant in the consulting department and his many of his daily tasks are not standardised. He works in different project teams and has to

continuously acquire new knowledge, especially about clients' circumstances. If Igor has a problem and he needs knowledge to solve it, his first approach is to ask people currently in his room. If nobody in the room has a reasonable answer or knows another person who can help, he initiates a discussion about the topic regardless of what tasks his colleagues are currently engaged in. In many cases, solution ideas could be generated or the discussion team can refer to somebody. Igor has a good network and maintains relationships with other people. He uses breaks to get information about other people's work and activities or to discuss own work problems. Thus, he has a comprehensive picture of ongoing activities and is constantly well informed. His motto is "There are no stupid questions, only stupid answers."

One long-running case being an example for a maturation of knowledge is the process describing the introduction and development of the portal technology. The process started with the employment of a university alumni interested in portal technology. He sparked interest by his team leader and his head of department who let him pursue the topic. After searching for existing information within the company, by the vendor of the solution and talking to colleagues, the portal technology was found to be promising. He was sent to a training course by the software vendor. It was then decided to use this knowledge within a pilot project creating a prototype for internal use. When this project became a success, plans for a commercial solution were made with the company's main shareholder as a first customer. The original employee responsible for introducing the portal technology became manager of this project. In parallel, the internal pilot project was enhanced with the effect of further training employees in applying this technology. After successful implementation of the customer project, further plans for an enterprise roll-out were made in which the initial employee was included. With the maintenance of the first productive solution, several challenges within the company arose, which forced changes in the internal processes, as this technology needed different support and communication structures due to its integrated nature.

This case (over a duration of approximately 1.5 years) states a maturation within three dimensions: The *product knowledge* concerning the portal technology and its documentation is developed by several projects. *Employees* learn about new technologies and advance personally. Finally, *processes* were adapted.

### 3.2 Study II: Health Care Training and Consulting

The second study was conducted at the training and consulting center of a hospital with 4,000 employees in total. The studied unit is responsible for organising, planning, and implementing advanced vocational training events (mainly for nursery care), but also offer mentoring and coaching services; these are for both internal and external customers. Five employees were observed by three ethnographers, which allowed for immersion into everyday activities and training. All have several years of professional experience and a well-developed social network within and outside the organisation. From the observed individuals, we could aggregate two personas: Silke, characterised by a sense of perfectionism, and Otto, exemplifying the impact of organisational constraints and the behaviour of his superior on motivation.

Silke had completed her academic studies after a vocational training. She still tries to stay in contact with her former occupational group in order to stay up-to-date

with practice. For her, it is essential to have clear structures for the paper-based and digital part of her workplace. These structures are both based on subject (as a kind of reference book) and chronological (for business transactions). This applies both to documents and emails. Although currently these structures and document archives are mostly used by her alone, she would also like to have access to similar sources of her colleagues in order to avoid redundant work. She finds shared folder structures with several levels difficult to use because the criteria for structuring are not always her own. Also, labelling of files is frequently a source of problem. She also has a deep concern about data safety and, thus, keeps an archive of all documents in paper form. When working on her emails, she always checks all mails in the spam mail folder in order not to lose any message. She often has problems with the usability of computer software. Clear structures within applications that do not change with software updates are crucial as she lacks deep knowledge about computers. She has high personal standards and aims at continuously improving her work practice. Thus, she regularly reflects on how tasks were carried out and what could have been improved. Based on those insights, she updates templates and process descriptions. Where possible, she discusses her experiences with others. This sense of perfection also applies to her everyday task management. She meticulously plans her tasks and appointments each day, and prepares each meeting with elaborate notes. She always uses paper and pencil for plans, as she needs the feeling of satisfaction of ticking off completed items.

The following case illustrates the impact of personal motivation on knowledge maturing: As part of the ward manager course, participants have to do a “hospitation” (mixture of job shadowing and internship). As a result of group work and based on a similar approach by a colleague, the trainer had the idea of introducing reports on “hospitations”, mainly based on the intrinsic motivation to make the training services even more useful for participants. In order to work out a template and guidelines, the trainer asked a colleague for an example of such reports and then searched the Internet in order to evaluate the suitability of the example. Then, the trainer drafted some initial guidelines, which were compared with the other examples and revised until an agreed quality standard was met. Then, these guidelines were applied, and participants were required to produce reports based on these guidelines. Reports were assessed. The experiences were consciously reflected upon to feed into an improvement cycle.

### **3.3 Study III: Telecommunication Provider (TP)**

TP is a leading telecoms company with 20,000 employees delivering a full range of services and products for mobile, fixed and IP-based voice and data communications. Employees were studied by two ethnographers. These employees are involved in the “Customer Experience Design Process”, which is a standardised process to develop and maintain new market services. The aim is to promote the TP brand with customers and to improve customer experience. Two cases have been researched: (1) customer experience design in which product managers are responsible for a running product (life-cycle management) and product development in the sense of new customer experience. (2) Project management comprises assigning project managers to projects, if necessary recruiting new project managers and checking project status.

For each case, one persona could be identified: Kurt represents product managers of the customer experience design and Thomas represents project managers.

The responsibility for project managers and their projects as well as recruiting new project managers requires a wide variety of knowledge. Therefore, Thomas is highly skilled and experienced. He acquires knowledge on existing products, technological developments and visions as well as market trends by reading and reviewing internal documents about projects and organisations as well as consulting appropriate sources like internal portal entries, newsletters, books, magazines, blogs, and forums. Knowledge about his colleagues and about other people is highly relevant for him for, e.g. assigning appropriate people to projects. Therefore, he maintains relationships in his social networks through informal meetings, workshops and by using Web 2.0 technologies, like forums, online-communities and blogs.

Thomas' motto is that a phone call is more efficient than 10 e-mails. Therefore, if he identifies a problem which occurs in a project, he firstly calls the responsible project leader. Smaller problems are discussed directly on the phone, otherwise he makes an appointment to bilaterally discuss the problem. If the problem cannot be solved bilaterally, he invites a couple of people involved in the project and tries to find a solution together. As a last resort, he invites external experts.

### **3.4 Study IV: IT Franchising**

The studied organisation is an IT-related company and its main branch of business is franchising for retailer in the area of IT and software development to support this branch. It has about 130 employees in eight departments and supervises about 2,100 retailers. One of the most distinctive features of the organisation was their decision to introduce a MediaWiki platform as the organisational knowledge base to foster a Web 2.0 community style organisational culture. Five individuals from five different departments were observed.

Overall results provide detailed insights into a heterogeneous working structure, which only partly allows to extract and support knowledge maturing processes. Observed employees differed particularly in their processes for solving problems and getting information. This depended not only on the department, but on individual attitudes on how to work most efficiently and their affinity to using computers. Four personas (Axel, Heather, Kevin and Stella) were created to differentiate the characters and one is presented in the following.

One creative employee is Axel; a knowledge worker in the department of e-business. His tasks require him always to be on the search for news and to stay in contact with business partners to know their special interests and problems. His demand for learning is almost always because of a request or a problem or some news he read on an Internet site. He loves to research new information in his area of work and interest. If Axel has a problem, he always uses communication channels like chat, email, Twitter or the telephone to solve it. Only when he cannot solve the problem, he uses Google or another search engine. If he does not find an answer, but knows that it is important for his work, he often tries to contact a person who might help him in one of the well known business social network platforms.

Axel often changes running tasks and works on them concurrently. Sometimes, this behaviour brings him in conflicts as he does not answer fast enough and does not concentrate on prioritised tasks. However in most cases, it results in matured



knowledge artefacts as he often corrects his results in a personal review process. He is very censorious concerning software, tools and services. He likes trying new ones, but the benchmark is his actual way of work and he expects them to integrate in to it seamlessly.

An example case of a knowledge maturing process starts during his every-morning-check of his favourite blogs. Axel finds a blog article concerning new features of a browser. He opens a text editor and starts to collect the information he thinks important for his colleagues. Therefore, he starts to write an internal blog article on his computer in a file to ensure that he does not lose the text before he publishes it online which shows the need for sustainability of knowledge artefacts. During writing, he always changes between the text editor and the browser to add more fragments into the new article. Moreover, he searches for additional information in the Internet to reflect and present the topic as complete as possible. Before finally publishing it, he corrects it and reads the text several times to change format, syntax and wording and, therefore, increases quality and readability. This process can last several hours as he switches between his tasks occasionally.

### **3.5 Study V: Careers Guidance Services**

Study V consisted of two independent organisations in the same sector. Careers guidance services I provides free impartial and confidential advice, careers guidance, support and personal development services to young people aged 13-19 years and to those up to 25 years who have learning difficulties and disabilities. The organisation employs over 300 staff and is geographically spread, which offers distinctive problems in its operation and knowledge maturing activities. Sixteen employees were studied by three ethnographers; the results of which were combined with an earlier in-depth study of the organisation. Careers guidance services II is a national organisation delivering career guidance and employability services. The aim of these services are to help and support individuals to make informed choices and decisions, and to be prepared and ready for work in a changing and dynamic labour market. These career guidance and employability services are available to people of all ages. Personalised services are delivered in conjunction, and in consultation, with a range of partners. Careers guidance services II has over 1,000 employees and was studied by four ethnographers.

The overall findings suggest that employees tend to employ individual and personalised strategies for knowledge development and sharing, particularly as confidence and competence in the use of technologies varies greatly. Data analysis revealed five types of knowledge maturation, eight personas and some use cases. Personas, including a practitioner, senior manager, marketing and IT specialist, exemplify how individuals rely on collective knowledge to carry out their everyday jobs, in developing and sharing knowledge through their work and involvement in overlapping and asynchronous professional networks.

Gina, a persona developed around the work processes of an experienced practitioner, had gained a specialist work-based qualification and regularly participated in professional development activities. Gina operates with good knowledge of her local area and the opportunities available to young people. She is responsible for maintaining a section of labour market information in hard copy accessed and used by others working in that area. Knowledge is researched and



developed through a range of acquisition processes using various tools, such as the Internet and hard-copy resources, plus talking to professional colleagues. Criteria are applied to enable selection of reliable and valid information. At the local level, this information is shared, but not stored or disseminated by any other means. Regular team meetings are considered essential to share new knowledge and keep up-to-date with developments, initiatives and opportunities for young people in the locality. Although this is considered essential knowledge for practitioners, there are few means in which to share or disseminate to the wider organisation. Here, individuals play a vital role in organisational knowledge maturation, as they hold the information and knowledge, and determine what will be shared and with whom.

A corresponding case of knowledge maturing captures how a practitioner responds to a request from a client/customer for a specific piece of information. The practitioner would go through several stages of knowledge maturing comprising: searching for relevant sources of information and (ideally) applying quality criteria, before information is aggregated in a meaningful way and integrated into existing knowledge; manipulating organising, or rearranging, these sources of information for interpretation and the expansion of new knowledge; analysing newly acquired knowledge to integrate with broader sources of information; storing and sharing new knowledge in a robust system; reflecting on their learning and newly acquired knowledge, which may result in further research and consolidation of new knowledge into a different form; presenting new knowledge to the client/customer making professional judgements about its form and manner; re-presenting knowledge through a process of sophisticated mediation for different purposes; sharing emerging understanding, or particular knowledge, with colleagues; and finally, networking by engaging in a systematic dissemination of knowledge.

### **3.6 Study VI: E-learning and Consulting Services (ECS)**

E-learning and Consulting Services is a small company with 30 employees. It has provided e-learning solutions and consultancy services for the construction sector since 2001. ECS has developed a technology platform that is offered via a service application provider model to its clients, allowing them to implement training and courses as well as knowledge management capabilities. Their objective is to empower companies to exploit their knowledge assets so they can improve their creation, transformation and distribution throughout the organisation. The employees were studied by one ethnographer. Based on the collected data, two personas were identified: Carolina and Raquel.

Raquel holds a bachelor degree in education and specialised studies on multimedia related areas and technologies. She works as a course producer and consultant for ECS. She works in different project teams and spends 80% of her time in her office. She organises her own workspace with hierarchies based on sources, topics and projects. Raquel uses her own criteria to solve a problem, but continuously shares them with her colleagues and manager and asks for their opinions. One of the most common routines is the creation of story boards of course processes and user interaction. Raquel is very open to work-related comments, questions, anecdotes, etc., likes to help and is not afraid to ask directly for help if she needs a hand, has doubts, or does not find the solution.

One observed case deals with the creation of on-line courses. This process started with a meeting between the client, the director and consultants in order to gather the requirements for this part of the project. The consultant then created a profile of the objectives of the course. After that, he created an index of the course content. For each specific item on the index, a block of content was developed. The content was delivered as .doc and .ppt and then was revised and refined by ECS and the client. Finally, the content was converted for use within the learning management system. This is one of the most common types of projects for ECS, hence, it is a well established process.

#### **4 Towards a Unified View of Personas Across Studies**

While the results of the individual studies seem interesting in isolation, we found it particularly useful to compare the results, specifically the personas, across the diverse set of organisations that were studied. The proposition here is that due to the seemingly increasing standardisation of hardware, basic and application software that is typically used by knowledge workers, their work environments are increasingly similar while they preserve distinctive styles of handling knowledge and learning that are dependent not only on personality, but also on the roles, social structure and work context.

The ethnographers jointly identified 21 personas (Figure 1). They were described according to 17 characteristics. These characteristics were classified with respect to [Pruitt, 2006]: (1) identifying details: name; motto, (2) roles and tasks: role; workplace; task management, (3) skills and knowledge: education and professional background; learning; knowledge; formal training, (4) context and environment: reaction to requests; communication strategy; content types; structures; important tools and (5) goals and motivations: problem solving; motivation; attitude towards technology.

Twenty-one personas were considered too many to be kept in mind in detail. [Randolph, 2004] suggests to concentrate on one or a small number of primary personas. Pursuing the aim of selecting primary personas, three of the ethnographer teams clustered them according to their perceptions with more or less support by structured approaches. Although personas vary in the way they perform tasks as well as in their behaviour, needs and objectives, it was possible to identify pools of personas with similar characteristics. The approach adopted by UIBK is described in more detail.

As a starting point for clustering, the personas were characterised according to three dimensions taken from the knowledge maturing process [see Maier, 2007]. Each dimension represents two phases of the knowledge maturing process as opposites. Each persona was then classified with regard to these three dimensions using an ordinary scale.

These data were used to create a graph as a visualisation of similarity of personas' characteristics. Finally, the generated graph showed three groups of personas that were named as follows: (1) aggregation & combination, (2) communicative & serendipitous and (3) routinised & isolationist (see figure 1, right-hand side).

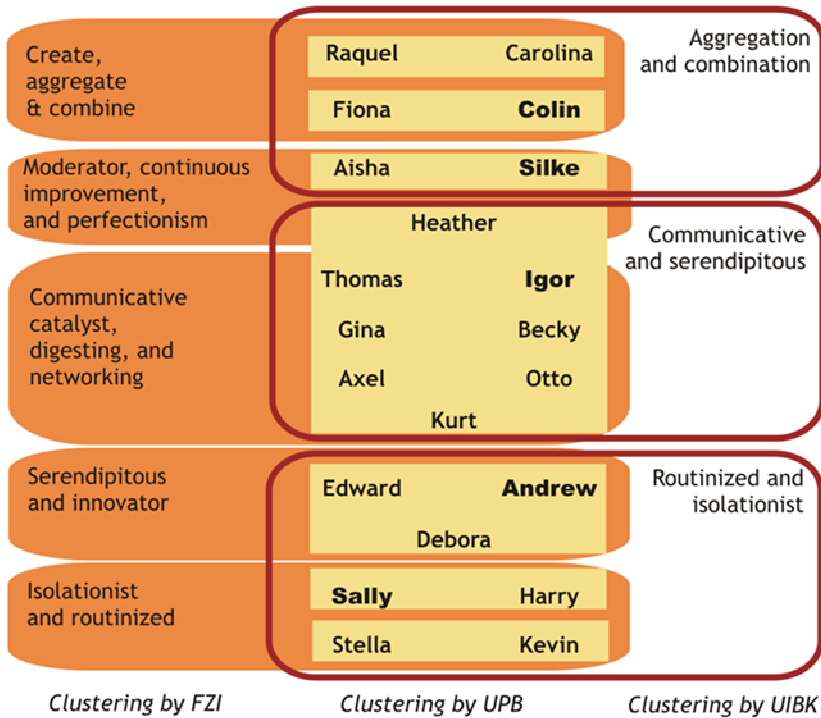


Figure 1: Clustering of Personas (for acronyms see affiliations of authors)

The FZI approach for clustering was focused on the two aspects contribution to knowledge maturing and how we could support the personas. It turned out that the five types of knowledge maturation using IT that were identified in the two organisations studied in the UK (see figure 1, left-hand side) were useful to describe the knowledge maturing aspect. There is some evidence that this typology can be transferred across other organisational contexts examined in this study and, thus, provides another good basis not only for clustering personas, but also for further exploring knowledge maturing styles:

1. *Serendipitous* Knowledge is developed and shared (typically) as part of a developmental process for a product or service and thus in an ad hoc and haphazard way. For instance, technical issues and problems are reported by email and telephone, and dealt with by one member of the team. This resolution is not recorded or shared with others unless it happens to be discussed or queried by someone on the team.
2. *Conscious* This is represented by communication and sharing of information in many formats both internally and externally to the organisation, which accords with an explicit (organisational) strategy. For instance, an individual has a clearly defined process and plan for communicating and sharing information external to the organisation.

3. *Network* Individuals heavily rely on information and knowledge being shared within local networks and held by individuals, determining what would be shared, when and with whom, but being often unaware of what they know, or how they acquired this knowledge. Knowledge maturation occurs in pockets across the organisation, but locally shared information and knowledge is not disseminated to the wider organisation.
4. *Isolationist* Here, individuals have no understanding that information and knowledge could, and should be, shared. For instance, project results and examples of good practice were not shared within the organisation.
5. *Visionary* Individuals or groups understand potentials and possibilities of IT in the process of knowledge maturation both within the organisation and externally, but are constrained by policy, finances or organisational culture. For instance, the value of implementing a new service at the forefront of technological developments is agreed, but organisational policy delays or halts its implementation.
6. value of implementing a new service at the forefront of technological developments is agreed, but organisational policy delays or halts its implementation.

The approach used by UPB is mainly based on three characteristics of the 21 personas allowing to observe how persons take part in and foster knowledge maturing processes in their social network: (1) How do the individuals solve problems?, (2) How do they react to requests?, and (3) What communication strategies and approaches to knowledge sharing do they use? Depending on the impact on the social network each persona had considering the three questions above, it was assigned to a particular cluster. By iteratively assigning personas in a group of similar personas or creating a new cluster of personas with different observed behaviour, 7 clusters were identified.

The three approaches result in quite similar clusters (see figure 1). Persona pools based on the five types of knowledge maturation were used as a basis for selecting primary personas during an informed group discussion involving ethnographers representing every studied organisation. The personas were evaluated according to their characteristics. Finally, the persona (depicted in bold letters) that was found to represent the respective cluster best was chosen as primary persona.

## 5 Conclusions

This paper presented selected findings of a collaborative ethnographically informed study. Both, method and results seem worth further exploration. Personas and cases seem to be useful instruments in order to render discussions about, e.g., use cases of tools intended to support knowledge work. This is in line with the benefits of using personas identified by Cooper as well as by Pruitt and Adlin [Cooper, 1999; Pruitt, 2006]:

- Personas help make user-centred design possible by putting users, or more precisely information about targeted users, at the centre of design.

- Personas enable team members to share a specific, consistent understanding and can be used to help guide decisions, e.g., about the product's navigation scheme and visual design.
- The development of solutions can be guided by how well they meet the needs, attitudes and behaviour patterns of Personas.
- Personas provide a human "face" so as to focus empathy on the people represented by the demographics.

Personas might be especially useful as an anchor instrument in order to convey goals, needs and context of using the intended system from the perspective of personas (that are grounded in real work experiences) with roots in the application environment of real-world organisations. They also stress the importance of being aware and master complexity of diverse styles of learning and handling knowledge dependent on the roles and contextual environment of the knowledge workers when designing an organisational and technical infrastructure for supporting knowledge workers. In the future, we intend to systematically reflect on our extension of rapid ethnography into a method of collaborative ethnographically informed study as well as the graph based approach to cluster and, thus, consolidate the results of distributed qualitative empirical activities.

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