Impact of Social Roles on
Designing sociotechnical Knowledge Sharing

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Abstract: This contribution describes results of an empirical study based on interviews with experts in "course guidance" at three European Universities. The sharing of knowledge about course guidance at the Universities is only fragmental and not systematical. This is a problem, especially for new students and beginners. The study´s goal was to shed light on existing roles in organizations and look at their impact on designing knowledge sharing. What are the role-based principles that have to be taken into consideration when designing sociotechnical systems?

1   Introduction

One of the problems at German universities is the relative high drop out rate less than 60 percent of students complete their university degree. It is a problem for the departments of social science (e.g. sociology), humanities as well as computer science. The drop out rate ranges from 30 to 60 percent, depending on the university and the department. The structure of the German University courses of studies is based on two phases:

1. The first period is a basic course of study which ends with an intermediate diploma (pre degree) and generally takes about two years.
2. The second period is a main degree program which also involves writing a thesis and at the end you are awarded a diploma and degree: This phase takes another three years, altogether the phases 1 and 2 take about 4-5 years. The problem is that most students leave during the basic course of study.

In the context of the so called WIS-project[1] at a German university we examined critical success factors and barriers for students of computer science courses during the first phase. We want to find out why the students stop their studies. How do they organize their studies at the university? Do they have enough information about how to organize their studies?

At the university there are a lot of roles, for example students who are beginners or who are experts, there are "tutors for course guidance", lecturers, an examination office, and so on. A lot of several roles which should collaborate. Our assumption is that the information about how to manage the students own basic course of study are not appropriate enough for the different roles.

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[1]WIS is an abbreviation for development the department of computer science at the University of Dortmund, Prof. Dr. Th. Herrmann. It was promoted by the state North Rhine Westphalia from 2001-2004.

We looked at the communication between the roles in relation to the management of basic coursework. The major question is as to weather we can establish principles of knowledge sharing from the role-based point of view. This contribution shows the results of our explorative study and critical success factors for knowledge sharing.

2   Theoretical Background

The term role was the topic of many discussions in the 1904´s and 50´s, particularly American sociologists. (The first German sociological discussions were started by Dahrendorf in 1958.) During the 1950's and up until the 1970's the role theory was criticised as not being fully able to explain the complexity of society and social systems. Therefore, role theory was no longer considered as complete sociological theory, but the term role was simply integrated as a basic term in contemporary social science. A more detailed description of the sociological and social psychological role theory can be found in [Herrmann 04]. Contemporary social systems theory, especially Luhmann's theory [Luhmann 95] include "role" as a basic term and so do other recent publications [e.g. Ashforth 01; Montgomery 98].

Roles are often defined as sets of activities performed by individuals. "A role is a set of prescriptions defining what the behaviour of a position member should be" [Biddle 66]. However, this is not enough to understand role behaviour in social systems. A role is the sum of all behavioural expectations of a social system towards the concrete owner of a role. He/she is in a certain position, which is linked to tasks and functions. Our view is that a role has the following four *role dimensions*:

1. Position: A role always refers to a position in an organization, which is linked to functions and tasks. The "position" refers to the hierarchy level in a business organization (e.g. organisational chart) [Linton 36].
2. Function/Tasks: The position implies special functions and tasks, usually in the form of explicit and documented expectations, rights and obligations, which are addressed to the role owner by the social system (e.g. job descriptions, work contract and task assignment). [Ilgen 91] differentiate between job and role).
3. Behavioural Expectations: The role concept covers more than just the formal job description. There are also expectations which are not explicit. It includes informal notions and agreements [Harrison 72].
4. Social Interactions: Within the limits of the social systems the role owner can actively shape the role he has taken. However, this shaping is dependant upon the interaction with other participants in the social system by means of communication processes. Roles are the result of a negotiation between the role owner and those with whom he interacts (face-to-face or computer mediated). The role owner *transforms* the role expectations into concrete behaviour (role making). Thus, each participant fills the same role (slightly) differently [Sievers 91]. Roles are modifiable, however this is a complex process.

Roles form a kind of communication pattern. They structure organizations to coordinate their own processes [Luhmann 95]. Therefore roles ensure organizational behaviour. A Role facilitates a person's behaviour in an organization, however the person can quit his/her role and another person could take over the role. (Note: The owner of the roles will have to bear the consequences e.g. negative sanctions).

3 Case Study

In the context of the WIS-project at a German university we examined critical success factors and barriers for students of computer science in their basic course of study. The department of computer science had 1.700 students who had enrolled for the basic course of study.

First we identified which factors were relevant and essential to complete the pre degree (basic course). Second we initiated computer mediated knowledge sharing and communication of these factors. We decided to use computer supported knowledge sharing for two reasons: (1) One was due to the large number of students that should be involved and (2) to document the process for the next generation of students (for successors). The survey of these success factors and problems based on an explorative study. The methods used for the survey were the following:

1. We interviewed 14 participants face-to-face (8 students and 6 professors/lecturers) to create a standardized questionnaire. The standardized questionnaire was sent out and 384 completed were received. This was a total of 20 percent of all computer science students enrolled on basic courses (2002).

2. Based on these results we initiated a web based discussion board, which allowed students to discuss these findings. Furthermore, the discussion forum was embedded into an information website which included facts about course guidance as well as a map about basic coursework. Together they are called INPUD (Informatics Portal University of D.) and can be found at http://inpud.cs.uni-dortmund.de. (Note: German universities offer multitudes of lectures, and students have to create their own semester plan of lectures; meaning they can choose to attend which lectures they want to when they want to.)

3. In addition to the previous items we wanted to integrate other roles into the discussion forum, for example other university lecturers as well as counsellors of computer science guidance courses. Therefore we interviewed eight experts in the field of course guidance at three other European universities. We based our interviews on an interview guideline. This was an **explorative study** as part of qualitative research. The data analysis was based on the methodology of grounded theory [Strauss 90]. Then, the empirical data were classified into (a) starting situations, (b) interactions/actions and (c) consequences.. (Note: consequences could bear new starting situations.). This method is called "conditional matrix" [Strauss 90]. Based on this conditional matrix we produced **the results**. Before we present the results we will shortly present INPUD.

Knowledge Sharing at Inpud Community

INPUD includes an overview of all *classes and lectures* which are on offer during the current semester. The information about the lectures includes learning groups (when they are being held), course materials, notices for examinations, lecturer contact information and often an own discussion forum. The discussion forum includes discussions about certain lectures (recently 12 lectures are on-line, each with a facilitator). On the discussion board it is possible to discuss exercises and their solutions. There are also *news* and *search* functions. Furthermore there are information and discussion forums initiated by the counsellors of *course guidance*. The discussion forums include questions and answers about course guidance. For

example "how and where to register for written examinations", "where to find the university calendar", "what are the contents of computer science studies", "which semester is best suited for studying abroad", etc.

INPUD has a continuous growth of participants. 880 registered participants have offered more than 13.000 contributions (as of 26.03.2005). (Note: Registration and login is only necessary when contribution is made. It is possible to read the side without registering and without logging in.) 40 percent of the INPUD community consists of students from the basic course of computer science studies. INPUD was launched in September 2002 and the number of participants grows consistently and at the beginning of a new semester the access rate usually peaks. In Oct. 2002 there were "only" 171.408 requests. A year later there were 292.155 (Oct. 2003) and by Oct. 2004 there were 491.330 requests.

In February 2003 a representative survey was conducted in the department of computer science. The outcome was that 96 percent (n=186) of all students enrolled on computer science courses at this university knew INPUD. No less than 80 percent have used INPUD at least once, and 41 percent use it regularly. The large number of participants is an indicator that a lot of students need this form of knowledge sharing. They discuss, ask and answer questions and come up with new ideas to help each other. The analysis of communication structure shows that a core of 67 individuals regularly made between 50 to 315 postings (questions or answers) per individual(!). That is quite a lot for a year. Furthermore 187 individuals provided 10 to 49 contributions. Inpudforum has an awareness function, which shows who and how many users are on-line at the same time. The community continually grows without explicit external advertising. INPUD integrates different roles. There are students, but also lecturers and tutors as well as counsellors of computer science course guidance. The integration of all was a conscious process. Students see the role name of a person in the discussion forum. If a counsellor posts an answer or creates a new role name it is also published. So one is able to differentiate between postings by students and those from other roles.

4 Explorative study results: Critical Success Factors

Web based structured information linked to communication processes is one of INPUDs advantage. That means, that for all lecture there is a website which has the same overview which integrates the lecturer, tutors and contacts (email, offices etc.) as well as the information of the day and time of tutorials and written examination. A book list is also available as well as related materials and online discussion forums which enable discussions and questionnaires to be discussed in face-to-face workshops. (Note: In a basic course of study up to 200 students take part in a lecture.) Thus, the on-line discussion forum supports knowledge sharing among students. They help each other among themselves. The lecturer and tutors have the role of a facilitator, who only intervenes if the students are on the wrong track.

The results of the INPUD-Case as explorative study are five critical success factors which give an insight into design knowledge sharing from the *role point of view*. The case INPUD shows that ….

Thesis 1a. **…it is essential to identify star roles and supporting roles**. Which roles are important for structured knowledge sharing? (The star roles have to be labelled as leading actors). At INPUD Community the student role is considered as a

star role and the other roles should see the student role as a star role. Unfortunately this perspective is not self-evident because the empirical data concludes that the experts (we have interviewed) neglected the fact that the student role is a star role. Research and the acquiring of new projects often are more important for professors and assistants. One argument is, for example, that projects protect jobs at universities. The counsellors of course guidance also have a star role. They collect information for example about lectures or other information about the basic course of study. They can help if students have questions about planning their basic coursework ("which lectures should I attend in the first / second / third /… semester?", "when and how can I register for the software laboratory?").

The knowing for which roles are star roles has enabled us to be able to support their knowledge sharing and the knowledge flow from **their perspective**. All other information about other roles are less important. All information and also the discussion forum at INPUD were designed from the perspective of the star role.

Thesis 1b.   …it is essential to be able to understand how beginners and other roles perceive the organization. Before individuals start at an university they perceive the university as only having two systems: They differentiate between themselves and the whole other part of the university. However, we know, that this is not the complete picture. A German university consists of many departments and administration offices, a central examination office, a lot of institutes, data centres, a central course guidance office as well as a course guidance offices in each individual department. What happens when beginners start at an university? They perceive a lot of roles with different functions but do not know what role is responsible for which task: "role jungle without a map" (an expert said) They need structures to enable understanding of course structures. To them also the role structures are unclear and complex. That applies also for other students in other roles and sometimes for people who work at the university.

The results show that the student role is currently only perceived as one role. However, students are beginners when they start their studies. Later they become "real" students and then they write their thesis. When they start searching for jobs they are in the new role of postgraduate students. Why is it important to differentiate?, because there are different expectations in different situations and different roles. However, the university expects the same behaviour from all students no matter what they are in "reality". In the beginning new students (beginner, freshman) do not know how to schedule and manage their studies. First of all they learn to take on the so-called role "student" and internalise the expectations. If we wish to cultivate a community to support knowledge sharing and knowledge transfer it is essential that we provide information for all students in their specific situations and roles.

At INPUD we have created a part of information linked to a discussion forum which is only for beginners (freshmen) and students in different roles. For example, there is an overview which tells them which lectures to study in which semester, and there is a discussion forum for students who need course guidance for example in planning their studies.

Thesis 2a.   …it is essential to support coordination. In order to clarify how to support coordination between star roles (e.g. students/counsellors of course guidance). The data analysis shows that the experts takes a central role coordinating knowledge

sharing as a process. They said they need this responsible role, as they need to act as a contact person and need to delegate their tasks e.g. activities of course guidance and act as a central collection of information for all lectures. This is just simple thinking, which in reality is too simple. This is an illusion because knowledge is distributed, decentralized and peripheralized. (One person can not know as much as what a group of people knows: the sum is always more than the individual contributions.)

At INPUD we cultivated a role for a coordinator who coordinates the activities of course guidance and the development of the sociotechnical knowledge sharing of INPUD. We call the new role "Coordinator of Counsellors of Course Guidance". He/she collects information about the course guidance and uploads these in INPUD. In this manner he/she distribute new information, for example, information about new rules of examination regulations. Students (may) annotate the information, for example exchanging their information about their tutorials.

Thesis 2b.   …it is essential to support this cooperation. There are only few cooperation processes and activities that involve all counsellors of course guidance in all 14 departments at the university. The cooperation between counsellors seems to be unimportant. This is a problem. (Note: the counsellor responsible for course guidance is often only a voluntary job and a non paid activity. It is a kind of self-administrated job within a German university.) The central course guidance organizes constant workshops ("constant quality circle meetings"). However, these process improvements are internal. They only involves the counsellors of course guidance, that means that they do not appropriately refer to student roles. What we miss is a better communication and knowledge sharing process between star roles (course guidance and student roles). An expert (chief counsellor of central course guidance) said: "We have the individuals, but where are the roles and where is the script that coordinates our knowledge sharing processes as a community?"

INPUD tries to support all star roles at an university from the students perspective. However, one problem we have in our case is that the communication only takes place in the department of computer science, although a lot of questions involves to other departments and administrative offices. For example, the registering for written examinations is one of the main activities of the examination office. In future we also want integrate and support these other star roles in INPUD.

Thesis 3.   …it is essential to clarify inconsistent Role-Expectations. The data analysis shows that there is a difference between self-perception and how others perceive the student role. The roles such as the examination office, counsellor of course-guidance and dean of department of computer science etc. expect students to be able to be co-ordinate the courses themselves. But beginners and other students see themselves as customers. Here we see the different expectations which tend to cause problems when cultivating knowledge sharing. One solution at INPUD was the suitable preparation of information for students and their requirements to help them manage their own studies. During designing of knowledge sharing at INPUD the students´ ideas and their requirements were included in the form of interviews and standardized questionnaires (seen in section 3).

Thesis 4.   …it is essential to clarify socio-technical Interactions. The INPUD-Community is a blended learning concept. The knowledge sharing takes place through online discussion forums as well as integrating co-located communication

(e.g. lectures, workshops, seminars). What we have learn from INPUD is that a concept for knowledge sharing should clarify the support of interactions and communication during different development stages (life cycle). For example, at the beginning it is necessary to have more co-located-communication to bring the participants together to get to know each other. The students who took/take part in INPUD get to know other students first, they see them at seminars, lectures and workshops. Thus, the on-line discussions in the INPUD-Community should to seen as a sequel to the face-to-face communication. The students continue their discussions on-line.

5   Role-based Aspects for Designing Knowledge Sharing

From the Case Study we can deviate between role-based aspects for designing knowledge sharing. This is a list of guidelines and recommendations on **how to** initiate knowledge sharing. From the *role point of view* the following four dimensions are essential in supporting knowledge sharing in organizations:

(1) Identify participating roles and their relationship to other roles (role dimension 1: *position*, see also section 2)

- Clarify which membership-roles play the leading parts (star roles) and which are the supporting actors (supporting roles)
- Clarify which roles should participate in knowledge sharing; which do not.
- Identify which roles currently interact with whom (which do not), and which roles should interact more with each other.

(2) Foster Coordination and Cooperation (role dimension 2: *function and tasks*)

- Encourage and intensify star roles and increase their resources: for example, give persons who take a star role more time and more authority.
- Clarify the organizational role structures i.e. role transparency: which role has which functions and tasks.
- Clarify the role skills e.g. facilitation abilities; offer qualifications to role owners.

(3) Clarify roles and their behavioural expectations (role dimension 3: *expectations*, see section 2)

- Identify if the role owner and the other roles in the organization have different or the same behavioural expectations towards knowledge sharing practice. Are there potential expectation discrepancies and which problems are linked with them?
- Clarify as to if the introduction of new roles is helpful. A new role should be deliberate and equipped with resources such as time or maybe even personal staff. Decide if these aspects are realistic or not.
- Clarify if a central role is helpful, who can coordinate knowledge sharing. Do the participating roles wish for such a central role and why? (Maybe there are some problems in current knowledge sharing, e.g. unfair practices or misuse of power).

(4) Sociotechnical Interactions (role dimension 4 *interactions*, see section 2)

- Identify if the participating roles have their own technical database and server systems or if they use the same technical system. Is knowledge sharing about several technical systems possible or do technical barriers exist? Clarify if knowledge sharing needs a new concept which is based on organizational measures and agreements of how to use technical systems. Is it possible to establish a new role called "database-traveller-role" which has access to the

different locked technical systems and different database? This requires a concept of access and security administration for participating roles (Sandhu et al.1996).

- Clarify if a "blended" concept of knowledge sharing is possible. This means the combination of face-to-face meetings (synchronous communication) and computer supported knowledge sharing (asynchronous communication).
- If a technical system is required to support knowledge sharing: is the technical access simple enough for all participants.? If a registration seems essential it should be simple and not too complex. For example, both information website and discussion boards can develop together in WIKI-Format (see http://wiki.org).

Conclusion: The five critical success factors and the deviated list of recommendations are based on an empirical explorative study which also include eight interviews with experts at three universities. The results are consolidated findings as part of a qualitative research. However it seems important to verify these findings with other case studies and maybe to check the results with a quantitative analysis, for example the measurement of the effectiveness of knowledge sharing at INPUD.

Acknowledgements

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