Collaboration Platforms for Virtual Student Communities

Petra Schubert

IAB – Institute for Business Economics
FHBB – University of Applied Sciences, Basel
petra.schubert@fhbb.ch

Michael Koch

Department of Computer Science
Technische Universität München, Munich, Germany
kochm@in.tum.de

Abstract

Since its inception, the Internet has served as a virtual meeting place for people sharing common interests. These electronically supported interest groups are nowadays called Virtual Communities. Networked computers are used to support direct communication and indirect information exchange, and to provide awareness and matchmaking services. The use of member profiles adds a new dimension to the support of the interaction between community members. Information about the members is needed to introduce the members to each other and to empower individualized services. The paper describes the research design of two empirical platform projects, one of them carried out in Germany, the other one in German-speaking Switzerland. Both projects are targeted at students and their respective needs for information, interaction and exchange.

1 Introduction

Several types of applications advertise "community support" or "collaboration support" features. Using this label, Web platforms and electronic commerce systems are equipped with annotation functionality and various communication features. In general, community support includes all methods for supporting communication and coordination in a group of people. It includes support for direct communication, support for indirect information exchange and support for awareness and matchmaking. Community support is closely related to the application areas of knowledge management, user relationship management and change management since these also deal mainly with the support for communication in a loosely coupled group of people.

Community support platforms are in use in several different application areas. One example are platforms supporting user communities, which pool their knowledge and their profiles for communal use and render economies of scale effective in a new way [Schubert 2000]. In the university domain we find communities of students (e.g. students attending a joint class), communities of employees (the staff of one department) or the alumni network. These communities can profit from Internet technology as a communication medium. In addition to supporting existing communities it is also possible that new communities emerge on electronic platforms (e.g. the alumni of a department that does not provide a special alumni program or alumni reunions – as is the case in some European universities).

In the context of collaboration platforms, the use of member profiles adds a new dimension to the support of the interaction between community members. Information about the members empowers individualized services.

The paper describes the research design of two empirical platform projects, one of them carried out in Germany, the other one in German-speaking Switzerland. Both projects are targeted at students and their respective needs for information, interaction and exchange. The paper gives an overview of the application of electronic platforms in the student domain with a special focus on personalization, especially the use of member profiles.

The introductory chapter provides an overview of Virtual Communities and collaboration platforms (Chapter 2). The following Chapter describes the two community projects and highlights the acquisition and use of user profiles in these projects (Chapter 3). In Chapter 4 we introduce a systematic approach towards personalization. We first look at the prerequisites for personalization (Section 4.1) and the potentials for its application (Section 4.2). We then present the four steps of the user profile life cycle (Section

4.3): the modeling of user profiles, the actual recording of data, the conversion of the input into something which is fit for use for personalization and finally the actual use of the refined information for personalization features. We conclude our discussion with a summary of our findings.

2 Virtual Communities and Collaboration Platforms

In general, a community is a group of people who are sharing a special interest, who identify with a certain idea or more generally happen to be in a common context. Current definitions often also require that the community members have a possibility of communication and act to collaborate with each other or mutually help each other [Ishida 1998].

The main activity in communities is communication and finding the right people for collaboration. Hence, community support can be seen as "communication and matchmaking support". Community support systems have to provide a "medium" that can be used for the interaction among the members. This can be a clubroom with bulletin boards, a club magazine or regular physical meetings. In the same way, networked computers can be used as medium for the interaction in a community. Such a solution is often labeled a "platform for community support" (community platform) or "community support system".

When talking about community support we often distinguish between "local communities" and "virtual communities". Local communities are groups of people with roots in the real world, who meet face-to-face regularly, and use electronic information systems only as an add-on to extend their reachability. Virtual communities are groups of people who would not otherwise form a community without the assistance of electronic media. The members of a virtual community only or at least mainly communicate through electronic communication channels. Computer-mediated communication is an enabler for the Virtual Community. In contrast to local communities, this situation offers new possibilities and dangers of anonymity [Dyson 1997]. In most cases however the virtual communication is enhanced by physical meetings. Even in communities that began as pure virtual communities the members tend to ask for and arrange physical meetings. Especially in the university setting we find hybrid communities which meet in real life and which profit from a virtual platform.

Bringing communities of people together stimulates three major potentials: (1) the building of trust, (2) the collection and effective use of community information and (3) the economic impacts of accumulated buying power.

Accumulation of buying power can be found where groups of users are drawn to the Internet in order to perform online purchase transactions. Those groups are often referred to as Virtual Communities of Transaction [Schubert 1999]. In addition to the accumulation of buying power this type of community is a source for valuable data about the community members (generally addressed using the term "user profiles") that can be harnessed by the operator of an electronic transaction platform [Schubert/Koch 2002] with the consent of the users. In communities of transaction the additional information about the users is often the basis for personalization by making use of techniques such as collaborative filtering, data mining, and personalized user interfaces as described in the following chapter. Platforms for communities of transaction result into an enriched product catalog which has been termed "Participatory Electronic Product Catalog" by Schubert and Ginsburg [2000].

While user profile information collected in online communities may be valuable for the community operator, we have seen that the hype around communities as "Virtual Enterprises" glorified by Hagel/Armstrong [1997] has faded. However, the knowledge-oriented view of buyer communities taken by Hagel and Armstrong still seems very promising and its full potential for personalization is only at its beginning. The transparent collection and usage of member profile information in online communities might, in the future, be of profit for both the users of (community) services and the service operators.

3 Two Case Studies of Existing Students Communities

There are various examples for Internet-based platforms which use profiles to implement automated personalization. The most popular one is the Amazon Web site which offers a large set of different personalization and recommendation methods.

In order to illustrate our research design, we picked two current research projects in which the authors are working on advances in personalization models and technologies. Both research projects are addressing student communities.

3.1 Lifestyle Communities and the Cosmos Project

Lifestyle communities are communities in which the commonality and the cooperation or mutual support is rooted in the lifestyle of the members. In Webster's New World Dictionary "lifestyle" is defined like this: "the consistent, integrated way of life of an individual as typified by his or her manner, attitudes, possessions, etc."

Since the "way of life of an individual" is a broad concept, we restricted the concept of lifestyle to leisure time

(thus excluding work life). When addressing a lifestyle community we think about a "leisure community" – a community whose main purpose it is to organize and perform leisure activities in a group of people. Examples for leisure communities in real life are sports clubs or cliques of friends.

The project Cosmos (Community Online Services and Mobile Solutions)[1] aims at exploring possibilities and solutions in the area of mobile lifestyle community support. The goals of Cosmos are evaluating technical requirements and conceptions for mobile community support. Additionally, relevant economic questions are identified and investigated. The focus is on operation and business models for mobile communities. Although the ideas of „lifestyle" and „leisure time" are of increasing importance to human beings, operators hardly manage to generate significant revenues or profits from their operations. In Germany, for example, only few economic success-stories of community operations can be identified [see Koenisch 2001].

The project concentrates on already existing communities. In the first step, we identified existing lifestyle communities in the target area and evaluated their potential for mobile community support. Student groups of Technische Universität München (TUM) were chosen to be supported in the coordination of their activities in the university and especially outside the university. Examples of such student groups are the active students in the TUM-Business-Club, the students of the „Sport-Kreativ-Werkstatt" or the student groups that are organizing events like TU-cinema or TU summer festival. These groups have in common, that they do not only study together, but also share the organization of (leisure) activities together in the university environment.

3.1.1 Studiosity.de

For the support of the selected groups and additional spontaneous groups we built an online platform which can be accessed via the Web and from mobile devices. The "studiosity.de" platform especially supports small (open or closed) sub-groups of the large community of all students. The platform is targeted towards enabling the community members to coordinate their lifestyle activities. Thereby, we focus on community-centered presentation of information and on text/multimedia based messaging and community content services that make use of the location information.

Services (desktop and mobile) will be targeted towards:

- *Coordination of activities and exchange of information around events*
- *Location awareness in sub groups*
- *Location and availability aware communication*

The platform provides an information space which can be filled and extended by the community members. The information space of the community is centered around lifestyle events. Extension of the space means both adding new events or announcements (items) to the information space and adding comments to the items. Hence, the central concepts of the information space are (information) items and annotations to these items. The items can be categorized or be annotated with different meta information (e.g. information about locations or time intervals).

In addition to the information space we provide different communication channels and user profile attributes for location and availability which can be accessed by other users or used in automatic processing rules (to ensure privacy and provide different information granularity to different users).

3.1.2 Personalization and Context Sensitive Services

In addition to the "anytime, anyplace features" (access from everywhere and at any time, being accessible anywhere and at any time) the extension of support for communities via the integration of mobile devices supplies a broad spectrum of context data for personalization of the community services. The most important contextual information in the mobile scenario is the information of someone's whereabouts (the current location). Other contextual data include the interaction in which the user is currently involved, temperature, velocity and direction of movement etc.

Previous systems used contextual data in location based information services. For community support we think of location- and context-based communication services. In the following we will discuss possible service categories for the studiosity.de platform.

Services for matchmaking and awareness

Matchmaking is the process of bringing together people who dispose of common attributes (flirting services, expert finder services etc.). This can be done proactively by pointing to a person that might be interesting to contact (and displaying an explanation why) or non-proactively by simply providing awareness of who is around (a topic, a place) and visualizing interesting (public) features of this person. Providing awareness can also be offered for people already known to each other. Such awareness services [Schlichter et al. 1998] provide information and notifications about people one has put on special (buddy) lists. Having this information available can help to arrange spontaneous communication.

The features of mobile devices which open possibilities for new services are manifold. 1) It is possible to start a query regardless of current location or to be notified of possible contacts at any place. 2) Location and other con-

[1] The project COSMOS (Community Online Services and Mobile Solutions) is funded by the German Ministry of Research and Education (BMBF FKZ 01HW0107 - 01HW0110). See http://www.cosmos-community.org/ for more information.

textual attributes can be taken into consideration for selecting contacts. These features make it possible to use matchmaking for spontaneous activities and for immediate face-to-face meetings (if contacts where selected based on a similar location).

Implementing features for matchmaking and awareness in a community (platform) might also help to address the privacy issue which usually comes up when using and presenting user profile information. A community can be a perfect place to control access to such attributes by capturing and defining relationship networks (e.g. in the form of buddy lists) which can be used to define access control.

Services which support synchronous communication

Synchronous (speech) communication is still the most important feature of mobile devices. Synchronous communication can profit from being embedded into a community in different ways. Community platforms can provide powerful functions for reachability management. Users can specify rules and parameters in their profiles which enable other community members to look up the reachability status of someone they want to call before actually placing the call.

Knowledge of other users' profiles and contextual data (which can conceptually be regarded as part of the profile) can substantially increase the power of reachability management by e.g. automatically detecting a business meeting by deducing it from the fact that a certain number of coworkers are in a room together. A much broader basis for the application of machine learning algorithms for inductively learning reachability patterns will be given by monitoring not only the motions and contexts of single people but also the motions and contexts of groups of people.

Services that support asynchronous communication

Sending asynchronous messages (email, SMS, etc.) is a very effective way of communicating and profits from both, the community scenario AND the mobile scenario. Sending messages to groups of people who are defined through combinations of attributes is one possible application. The group can thus be defined as "the group of people with a current location near me" or "the group of people with a future location near xy" (tagging messages to places). In addition to pure messages, community support services should also allow to collect community information and comments on such information, and make new items available as messages.

Besides, manually triggered asynchronous communication or information pull as well as automatically triggered personalized and context-sensitive communication (push services) are very useful, too. The system can inform users of the presence of other community members or of information that is useful to groups of community members at this location and time.

3.1.3 User Profiles in studiosity.de

For providing the services discussed in the previous section in a personalized way, several types of user profile information are collected and used in the studiosity.de platform.

The profile is subdivided into the following parts:

- *identification profile: user name, contact information*
- *location and availability information*
- *interest information (self-classification in predefined classes)*
- *ratings (reviews of items)*
- *relationships (different buddy-lists)*
- *calendar information (information about the users agenda – both general information such as "on workdays from 9 a.m. to 6 p.m. I am in the office" to information about specific appointments such as "on February 5th I will be in London for a meeting from 10 a.m. to 12 a.m.")*
- *interaction profile: communication events (user sending messages to other users via the platform or from her mobile device), browsing actions (user reading items), annotation actions (user annotating items)*
- *annotations to the items*

These attributes are supplemented by a set of preference rules, which manage

- *The access-privilege-(privacy)-preferences of the user (who may access what parts of a user's profile under what circumstances (in what context))*
- *The communication preferences of the user (who may communicate with me on what channel under what circumstances (in what context))*
- *Automated setting patterns for dynamic profile parameters which are not desired to be measured automatically or which are not desired to be manually updated (e.g. location is not tracked automatically, but rather set by such "default" rules like "if(0800<time<1800) then location=work" where "work" is a predefined location representing ones workplace. Such rules can be bound to profile information, e.g. the calendar information in the profile.*

The information in the user profile is used for providing personalized, context-sensitive services to the user and for displaying it to other users or to provide context-sensitive services to the other users (the current location of a friend may be an important part of one's context).

- *selection of information (newly posted items or annotations) to push to user or to display prominently on the pull channels according to the user's interests, the user's relation to the posting community member, the user's current location and the user's communication preferences*

- *selection of notifications about changes in other user's profiles*

The most important information in the user profile for personalization are buddy lists because they define people of interest. In contrast to simple information portals or e-commerce sites, this information is of major interest in communication support platforms (community platforms).

Due to the focus on mobile devices, information about the location of users is also central to the studiosity.de services. Knowledge of current location influences availability and communication preferences of a user (via different rules). It is used for selecting appropriate items to recommend or find other community members.

3.2 VICOS – The Virtual Community of Students at UAS Basel

Our second example is a student community in Switzerland named VICOS. VICOS is a hybrid community: it combines aspects of a Learning Community as well as of a Business Community [Dettling/Schubert 2002]. The key research objective of this community is the linkage between the conceptual community design and a valid business model, which is needed to successfully operate VICOS as a sustainable Internet platform.

The idea of VICOS arose in 1999. Students of a specific kind of university, the Universities of Applied Sciences (UAS), are spread throughout Switzerland. VICOS was meant as a service for binding them together spanning geographical and cultural borders. The Internet and concepts of the "virtual community" provide instruments and models, which should make it at least theoretically possible to make a contribution to the development of a UAS identity at relatively small cost. In addition to the aim of creating an identity, this platform is supposed to offer practical support to students in many aspects of day-to-day student life, above all in the search for information. VICOS, as a virtual community, is more than a pure information-search platform of the sort that abounds in the internet. It enables the management of contents "for students by students" and thereby above all supports interaction between the participants.

The VICOS concept was developed after carrying out a comprehensive empirical study which addressed the main target group (the students). An overwhelming majority of students at Swiss UAS stated that a special community platform for them was of vital importance. Most students decided that services for the support of studies and career were most important. Especially a digital library of student papers and a forum for topics for master theses were highly favored.

3.2.1 The Platform

The first prototype included those service areas which the empirical study showed to be the most interesting. This consists primarily of five areas:

- *A **market for master theses** and seminar papers in which authors can upload their documents onto the VICOS platform as a pdf file. Assisted by comprehensive search aids, seekers of information can comb the database and download the requested pdf file.*
- *A **job market** in which providers and seekers are matched. Students are able to enter their graduate profiles and references online. Companies can search this database according to different criteria such as desired place of work and position, availability, field of study, majors, degree, etc and gather short-lists of graduates. In addition companies can advertise appointments on VICOS.*
- *An **education and training forum** in which educational and training institutions can post information about courses and educational opportunities. In this way, graduates can continue their further education after going back to work.*
- *A **discussion forum** in which all aspects of study at a UAS can be discussed according to various thematic areas.*
- *A **notice board** with second hand shop, accommodation market, events, etc.*

These basic modules of the platform are currently being developed. Future extensions will comprise:

- *An **SMS service center** - Mobile services based on the preference profiles of the members (similar to studiosity.de)*
- *A payment gateway - Automatic payment debits and credits of document/information uploads and downloads.*

3.2.2 User Profiles in VICOS

The VICOS services rely heavily on member profiles. The following table presents an example for a specific user profile as it is used on the VICOS platform.

- *Identification Profile: user name (e.g. hmueller), name (e.g. Herbert Müller), role (e.g. student), contact information (herbert.mueller@uas-basel.ch), address (Bäumliackerstr. 1, 4000 Basel), payment information (VISA 1234 5678 1234 5678, good thru 11/03), etc.*
- *Preference Profile: region: Basel, notification: via SMS*
- *Socio-economic Profile: age: 24, gender: male*
- *Relationships: relationships to other users [e.g. "soul sisters"],buddy list: Peter Schnell, Mike Sauer, Andrea Bauer, Sabine Schmid*

- *CV: completed CV to be given to companies with a subscription for this service.*
- *Transaction Profile: downloads of paper in the area of: computer sciences and business, received notification on local events in the region of Basel*
- *Interaction Profile: click stream: page views of open positions in the IT sector*

There are some profiles (e.g. identification and preference profile) which are **explicit profiles** containing information which was entered by the user. This information is a result of the "teaching process" which is necessary to get started and receive the requested services (e.g. a notification service via SMS).

Additionally, there are **implicit profiles** which store information gathered during the identified interaction with the platform. The result is an automatic learning process which does not require explicit user input. Both explicit and implicit profiles can be used to tailor platform services to the need of the community member.

The VICOS platform will be accessible at www.vicos.ch.

4 Personalization and Member Profiles

Personalization is about selecting and filtering information for a community member by using information about the individual (the user profile). The information displayed on the screen is specifically tailored to the personal needs. From a technical point of view meta information of products or information is matched against meta information of users (stored in the user profile). There are various ways for service operators of cultivating user profiles e.g. "historically" by storing interaction with the service (e.g. click stream on Web sites) and purchase transactions or "explicitly" by asking for identification, preferences, relationships or ratings/reviews. What formerly only seemed to be possible for the corner shop whose store keeper knew all her clients personally, reaches a new potential in the online medium where every client leaves traces and thus "teaches" the system how to treat him differently from the other users. The time spent by the client to "teach" the system also leads to increased switching cost. The underlying precondition is that the user really wants to be addressed personally.

4.1 What makes personalization possible?

The ability to deliver personalization rests upon (1) the acquisition of a "virtual image" of the user, (2) the availability of meta information in the service and (3) the availability of methods to combine the datasets in order to derive recommendations for the user.

4.2 Personalization Steps

As presented at the beginning of this chapter, the basic idea of personalization is to learn something about the users and to use this information to tailor offers for services or information to the needs of the user. On a technical level personalization therefore can be reduced to four simple steps:

- Step 0 – Modeling User Profiles
- Step 1 – Data Input
- Step 2 – Data Processing
- Step 3 – Information Output

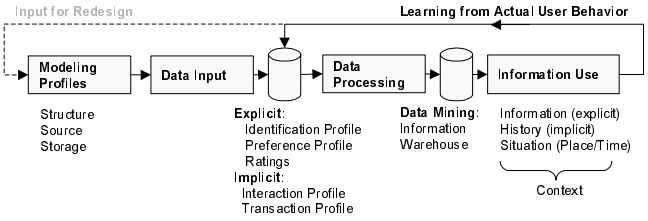

Fig. 1. User profile life cycle

4.2.1 Step 0 – Modeling User Profiles (Requirements Analysis)

The user profile includes all information directly requested from the user and the information implicitly learned from Web activity. Table 1 shows the different kinds of information which can be stored in user profiles. Depending on the personalization methods used, there are different requirements to the contents and the representation of the profile. Therefore it is inevitable to think about a user profile model before digging into issues of user interaction.

Explicit profiles	
Identification profile	User name, role, contact information personal browser settings, address, payment information, IP-address, etc.
Preference profile	Self-revealed preferences
Socio-economic profile	Self-categorization in predefined classes (age, gender, hobbies, etc.)
Ratings	Three types of ratings: of products, of reviews, of information items (pages)
Relationships	Relationships to other users (e.g. "soul sisters")
Reviews/Opinions	Plain text, images, videos and other material
Implicit profiles	
Transaction profile	Transaction log, product purchases linked to product meta

	data
Interaction profile	Click stream (pages viewed are linked to product meta data [preference categories])
External data	Information procured from other sources (e.g. weather report, local news, events, credit rating)

Table 1: Different types of profiles [following Schubert 1999]

Up to now, user profile models have always been defined for one particular application of the profile models – for one particular system. In the future it will become increasingly interesting to make user profiles available for different applications in the same application area or even in different application areas. Some research work currently focuses on (organizationally and technically) separating the user profile storage from the applications which are using it. This allows for the accumulation of user information gathered in different places. This initiative represents a marketing viewpoint as e.g. taken by Microsoft Passport. It leads to an increased level of control for the user regarding her profile [Koch/Wörndl 2001]. Some work about abstract modeling of user profiles and user profile servers can be found in [Fink/Kobsa 2000].

4.2.2 Step 1 – Data Input

The techniques for capturing user profile information vary and require the active engagement of the user at different degrees. We can distinguish between asking the user (fill-in-profile, explicit feedback or ratings) and watching the user, analyzing the data using data mining or web mining (click stream or transaction analysis).

There are different possibilities to acquire information about the interests of a user: (1) user maintains profile (explicit information input), (2) the system monitors the user behavior and determines her interests from using information clustering techniques.

1) Explicit information input (also called "reactive approach")

As already pointed out in the VICOS case, one way to gather data is to explicitly ask the user to fill in her preference profile. This can be done by selecting preferences from an ontology provided by the Web site or by explicitly rating products or information items from which the likes and dislikes can be derived. Examples for services offering personalization based on explicit information inputs are MyYahoo and the Amazon Recommendation Center.

Besides the use of explicit user inputs for the derivation of interests this information can additionally be made available to other users. Examples for this procedure are the acquisition and publication of explicit ratings and comments about products on the Web site.

2) Recording user activity (also called "non-reactive approach")

Shops usually record transactions in a database. This can be done both online and offline. Large off-line retail shops like Safeway, Migros or Coop have introduced membership card programs to identify users during their purchase transactions and to keep an identified log on their transactions (e.g. Migros Cumulus card). In addition to information about transactions, online shops store information about the browsing behavior of users. Page visits can be tracked and the time a user spends on a particular page can be monitored. The main problem with tracking the browsing behavior is the identification of the user. Since the information about the IP address of the requesting client is often insufficient for identification due to the use of dynamic IP addresses (e.g. different proxy applications or dial-ups) current sites try to solve this problem with the help of setting local browser cookies.

Users can even help to establish a new categorization scheme. If specific products are simultaneously bought by a number of users one could suspect that they serve a similar purpose and that it would make sense for other clients to know about the existence of the other books when buying one of the books from this cluster. An example for this "community-enabled categorization scheme" can be found at Amazon in the section "Users who bought this book also bought …".

4.2.3 Step 2 – Data Processing

The data collected from watching the user (transaction or browsing histories) usually is not suitable to be used directly in information filtering algorithms. So different data mining or web mining techniques are used to cluster and filter the data. In these processes, a user usually is put into different stereo-types or (interest) groups. The derived information is stored in the user profile for further processing. Data mining techniques can be applied to extrapolate trends noticed in the (large) database. This information can be used to improve and personalize the individual offer, which a company presents to a client [Fischer et al. 1999]. Unfortunately, as said above, it can also be used to share user data among a community of buyers without the user's permission.

4.2.4 Step 3 – Information Output

"The whole purpose of places like Starbucks is for people with no decision-making ability whatsoever to make six decisions to buy one cup of coffee - short, tall, light, dark, caf, decaf, low-fat, nonfat etc. So people who don't know what the hell they are doing or who on earth they are can, for only $2.95 get not just a cup of coffee but an absolutely defining sense of self." [Tom Hanks as Joe Fox in "You've got mail"]

Not everyone wants to take one hundred decisions when buying a product as simple as a Cappuccino. In his book "Die Multioptionsgesellschaft" Gross [1994] addresses the problem of today's individuals who are confronted with too many options. In marketing, the existence of different variants of a product is usually seen as a possibility to differentiate one's own products from competitors' products. For the pragmatic user the obligation to specify her wishes can be an obstacle. Say Peppers and Rogers [1997, 135]: "[...] but for the busy user who wants just what he wants, choice can actually prove to be a stumbling block to purchase." Personalization based on transaction and preference profiles enables a user specific selection from the wide range of options. The "burden of choice" is taken from the user. Imagine a user has already configured and bought a car, which also pleases another user with similar taste – it is easier for the second user to just order "the same configuration" than to run through the whole selection process again. Even if the user wants to make some adaptations it is easier to start with the recommendation of a more or less fitting configuration than to start from scratch.

In this section we will address methods to combine user profile information and meta-information of products or information objects. The goal of matching methods is to select something for the user based on his or her profile. In general, the selection can be about content (to be displayed), interaction (how to interact with the user) or media usage/configuration (on which channel/using which media).

There is already a broad range of methods and tools for filtering information of which the full text query is the most simple but most commonly used one. Work in information filtering is mainly presented under the labels "information retrieval" and "knowledge management". For the personalization of Web content and online-shops, there are integrated software packages available, such as One-to-One (Broadvision), Dynamo Relationship Commerce Suite (Art Technology Group), Personalization Manager (Net Perceptions) or ADAPTe (ResponseLogic). Taking a look at the general methods that can be used for personalization, one can distinguish between content-based filtering and collaborative filtering [Goldberg et al. 1992; Resnick and Varian, 1997].

Content-based filtering is based on annotating content objects (documents) with meta information or deriving the meta information automatically from the content of the objects themselves. A query specifies which values the meta information of matching documents should have. The comparison can be done directly, through affinity measures like vector space models or though neural networks. The shortcut of content-based methods is that the indexing (annotation with meta information) is an extra effort that has to be invested. Additionally, when using automatic measures, the results are usually not sufficient when the query is targeted at "quality" of information, e.g. for books that may please a specific user.

In contrast to content-based filtering collaborative filtering tries to match users with a similar taste. User profiles can provide personalization functions without a specific user having an extensive history of transactions. Based on information of like-minded people "matching" documents are recommended. The basic idea is to electronically support the principle of the "word of mouth". There are two forms, the first being interactive collaborative filtering where people interact directly (we will address this later when talking about community communication for user support) and automatic collaborative filtering where users rate items and the system automatically calculates correlations and recommendations.

In a brick-and-mortar setting most business users are not aware of one another. The same applies today in basic electronic shopping environments. Clients are carriers of information that could be shared with others for the benefit of all interested parties. Uniting buyers in a virtual community of buyers, harnessing the potentials of the underlying IT-infrastructure, can help to exploit community knowledge. Collaborative filtering is exactly about using information provided by other users to improve the offer for an individual user.

5 Conclusions

The future user will expect to be treated differently based on his or her personal profile especially when using mobile device based applications

One challenge of future community systems will be fulfilling the user's specific current needs. As seen in the case studies, this approach includes explicit information ("I want …"), implicit information ("what did I want in the past") as well as situational data ("where am I", "what is possible right now"). The idea of location-based services will rely heavily on the effective use of user profiles and contextual information (as indicated in Fig. 2).

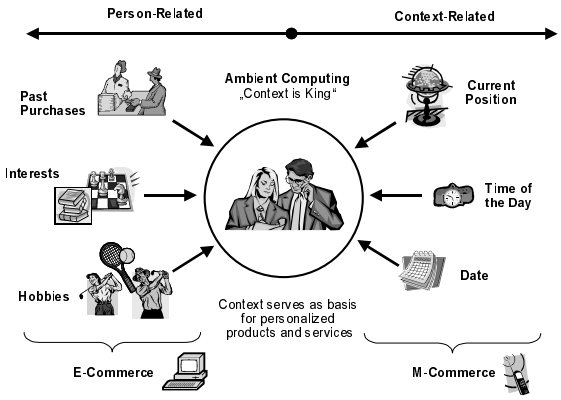

Fig. 2. Personalization is key to ambient computing

In this paper we took a general approach to personalization. We chose two specific research projects dealing with student communities where personalization is a key feature of the application.

The Cosmos project uses relationship information (buddy lists) and location information (current place and time). With this information, the application generates services which are tailored to the user's needs based on the current location and personal member preferences. The profile information is also used to provide services for other users.

The example of a specific VICOS user illustrates the complexity of user profiles. One of the main tasks will be freeing the user from the need to enter data into the platform (thus "teaching the system"). Internet users are tired of hundreds of different commerce platforms which are all asking the same questions. If a community service manages to successfully provide a user only with the information based on his preference profile (gathered explicitly as well as implicitly) a user is likely to come back to this platform. Well-used member profiles thus help raise switching cost.

We have deliberately excluded the discussion of privacy concerns in the context of personalization since this would be a topic for yet another research paper. In the Cosmos project, this issue is an important element of the research agenda. It has been addressed by looking at different means for the specification of access rights to user profiles (when making them available to other users). Nevertheless, even the authorized use of profiles by the service provider implies privacy issues. Providers of community platforms should bear in mind that they are always acting within a given legal framework and that they should seek the consent of the user before they store and use any personal data for their electronic services.

In the design of our platforms and in first trials we have found that user profile gathering and usage is closely related to the community interaction. Only the long-term relationship built up in a community allows a service to gather enough profile information to make personalization work. Once the platform gathers a certain amount of profiles, synergies can emerge from the information collected in transactions and information provided by the users. In order to use these synergies, the different types of information in the user profile have to be usable for both personalization and presentation to others. Additionally, the gathering and usage of profile information has to be highly transparent and controllable by the profile owner, the user herself, to provide the necessary trust.

In the future we will further evaluate the issues raised in the previous paragraph in the context of our platform projects.

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