Shaping online learning communities and the way adaptiveness adds to the picture

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Abstract: With learning being a process closely connected to sociability, learning on the web is in many cases accompanied and promoted by the creation and maintenance of online communities. Even though today’s web-based learning environments have drastically evolved and now incorporate techniques from other domains and application areas (such as web mining, AI, user modelling, and profiling), setting up a successful online learning community is not a trivial task. Experience has indicated that the road from assuring all technical prerequisites to having people participating and keeping the community ‘alive’, is long and winding. This paper argues that by monitoring the behaviour of community members, their expertise, skills, opinions and/or preferences and requirements and by applying certain adaptation mechanisms, the experience and effectiveness of online learning can be significantly improved.

Keywords: online communities; adaptiveness; personalisation; learning communities; topic recommendations; web mining; association rules; ontologies.

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1 Introduction

Learning is by nature a process closely connected to sociability and in the majority of cases, traditional learning implies the formation and operation of a community. Scientific observation during the last years has indicated that learning on the web in many cases is also accompanied and promoted by the creation and maintenance of online communities. Galusha (1997) points out that support for distance learners should not be overlooked when planning distance programmes because students want to be part of a larger learning community. Particularly in the case of online activities that are by nature remote and impersonal, the notion of setting up communities of users is of vital importance on the
path leading to successful learning. Research provides evidence that “strong feelings of community may not only increase persistence in courses but may also increase the commitment to group goals, cooperation among members, satisfaction with group efforts, and motivation to learn” (Rovai, 2002). Communities share common goals, needs, and problems and can promote solutions and progress if one gains insight into their ‘accumulated’ knowledge. Thus, if strong sense of community is related to increased persistence as well as to increased learning, then the sense of community becomes a foundation upon which to design and facilitate online teaching and learning. In real life, most communities are formed through geographical proximity, but online communities are mostly formed around a shared interest or need, and are a powerful tool for building trust and relationships, knowledge acquisition, and exchange.

Defining online communities is not a trivial task. A search in the related bibliography (in both the sociology and the IT domains) results in a variety of definitions with different focus and prerequisites that constitutes an online community. Probably the best known definition of online communities comes from Rheingold (1994) who describes them as “cultural aggregations that emerge when enough people bump into each other often enough in cyberspace” (p.57). Schmidt (2000) pursues a more agent-based approach (that does not solely take into account real people), according to which, communities are put together through agents – these can be human or software – which are linked by a common language and set of values and pursue common interests. These agents are tied together through a medium in which their roles interact with each other accordingly. Another approach from the IT domain comes from Prece (2000) and according to her, online communities consist of:

- **people**, who interact socially as they strive to satisfy their own needs or perform special roles, such as leading or moderating
- a **shared purpose**, such as an interest, need, information exchange, or service that provides a reason for the community
- **policies**, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide people’s interactions
- **computer systems**, to support and mediate social interaction and facilitate a sense of togetherness.

Core attributes of an online community – in the sense that communities with more of such attributes are clearer examples of communities than those that have fewer – comprise (Whittaker et al., 1997):

- a shared goal, interest, need or activity
- repeated active participation, with intense interactions and strong emotional ties among participants
- access to shared resources with policies to determine access
- reciprocity of information, support, and services between members
- shared context (social conventions, language, protocols).
The different types of online communities can be broken down by the purpose, and shared characteristics of their members and can be categorised as:

- **communities of practice**, where individuals share the same profession
- **communities of circumstance**, where individuals share a personal situation
- **communities of purpose**, where individuals share a common objective or purpose
- **communities of interest**, where individuals share an interest.

In some cases a community may fall into more than one definition, and over time a community may develop sub-communities formed around special interest groups.

Learning or educational communities are typically categorised as communities of purpose, with the purpose being learning. In the context of learning, the introduction of online communities has proven to be a quite promising concept, allowing the improvement of both the quality of online courses and the attractiveness of web-based learning environments. According to Reinmann-Rothmeier et al. (2000) a learning community is a community in which people are joined together by a mutual interest to intensively examine a particular theme, and in so doing are able to learn together, exchange existing knowledge, and jointly work on aspects of problem solving. Ideally, within the context of a learning community, knowledge and meaning are actively constructed, and the community enhances the acquisition of knowledge and understanding, and satisfies the learning needs of its members. Moreover, communities can counteract the isolation of the independent learner and the associated dropout quota (Seufert, 2002). Members of a learning community may be students, lecturers, tutors, researchers, practitioners, and domain experts.

Designing and implementing an online environment for supporting a community requires much more than merely providing for the communication and resource sharing capabilities. Online community designers are people who must combine “… the world of technology and the world of people, and try to bring the two together” (Kapor, 1996). In attempting to set up a successful learning community on the web, many things can go wrong and the road from assuring all technical prerequisites to having people participating and keeping the community alive, is long and winding. This paper argues that by monitoring the behaviour of community members (students and tutors), their expertise, skills, opinions and/or preferences and requirements and by applying certain adaptation mechanisms, the experience and effectiveness of learning online can be drastically improved.

The rest of the paper is structured as follows: Section 2 introduces the adaptiveness dimension and describes the process of applying it using web mining for delivering personalisation. The third section presents a pilot system for supporting learning communities and focuses on the incorporated personalisation features. Section 4 discusses prevailing open issues and concerns regarding the integration of adaptive features in the delivery of personalised web experiences, and Section 5 concludes the paper.
2 The adaptiveness dimension

Initial attempts of implementing personalisation were limited to check-box personalisation, wherein portals allowed the users to select the links that they would like on their ‘personal’ pages, but this has proven to be of limited use, since it depends on the users’ knowing in advance the content of their interest. These systems that can be explicitly ‘tuned’ by the user are called adaptable or customisable systems as opposed to adaptive systems, which are able to adapt themselves by observing, recording and analysing user activity (Manber et al., 2000). Collaborative filtering was deployed for implementing personalisation based on knowledge about likes and dislikes of past users that are considered similar to the current one (using a certain similarity measure). Such techniques required users to input personal information about their interests, needs and/or preferences, but web users are not usually cooperative in revealing these types of data and soon researchers resorted to observational personalisation. Observational personalisation is based on the assumption that we can find clues about how to personalise information, services, or products in records of a user’s previous navigational behaviour (Brusilovsky, 1996). The evolution of personalisation as we experience it the recent years has been dramatically influenced by web mining, a scientific area defined as “the use of data mining techniques for discovering and extracting information from web documents and services” (Etzioni, 1996). Eirinaki and Vazirgiannis (2003) provide a mining-oriented definition of web personalisation according to which it is “any action that adapts the information or services provided by a website to the knowledge gained from the users’ navigational behaviour and individual interests, in combination with the content and the structure of the website”.

Today’s web-based learning environments, apart from ensuring high quality content, correct and efficient structuring, as well as support for the tasks of all user profiles participating in the learning process, have drastically evolved and incorporated methods and techniques from other domains and application areas (such as data mining, web content, structure and usage mining, user modelling and profiling, artificial intelligence and agent technologies, and knowledge discovery) (Markellou et al., 2005). More recently, techniques that were initially developed for the e-commerce domain, in support of activities such as personalisation, cross-selling, up-selling, and recommendations (based on the underlying technology of clustering, similarity indexing, association rules mining, collaborative or content-based filtering, and more) are transferred and applied to e-learning applications. These techniques aim to tailor and deliver to the user an instance (or a ‘view’) of the e-learning environment that best suits personal needs, preferences, and objectives, or the view that best implements the teaching strategy decided by the tutor for the specific student cluster. This approach has been dictated by the fact that just like in real life, in online communities user tasks are different and users themselves are different.

Research activity in the e-learning domain and more specifically the ways of applying adaptive (or personalised) features in web-based learning environments has been intense. Several years after Brusilovsky’s work of 1996 on methods and techniques of adaptive hypermedia, it is widely accepted that adaptive systems adapt to user data (goals/tasks, knowledge, preferences, interests, etc.), usage data (data about the user interaction that cannot be resolved to user characteristics) and/or environment data (covering all aspects of the user environment that are not related to the users themselves).
Based on the same source and a later version (Brusilovsky, 2001) of the initial document, adaptive systems may produce as output:

- **adaptive presentation** (text or multimedia adaptations)
- **adaptive navigation support** (link hiding, sorting, annotation, direct guidance, or hypertext map annotation)
- **adaptive link generation**: discovery of new links and addition to the rest, link generation for similarity-based navigation, or dynamic recommendation of relevant links
- **adaptation of modality** (in the sense that apart from using text in order to communicate content other media types may be used).

At a research level, a number of systems have focused on specific aspects and theoretical issues deriving from the area of adaptive web applications and that of teaching and learning strategies; we indicatively refer to some of the most representative ones:

- **InterBook** (Brusilovsky et al., 1998) focuses on adaptive navigation support in e-learning systems and more specifically on link annotation techniques.
- **NetCoach** (Weber et al., 2001) derived from ELM-ART, which was one of the first adaptive web-based educational systems (Weber and Specht, 1997), and is a system designed to enable authors without programming knowledge to develop adaptive learning courses.
- **WebPersonalizer** (Mobasher et al., 2000) is a more general-purpose system used to provide a list of recommended hypertext links to a user while browsing through a website.
- **OOHDM** (Object-Oriented Hypermedia Design Method) is a methodology for designing personalised web applications and managing personalised views (Rossi et al., 2001).

The challenge for the new generation personalisation and recommendation systems is the integration of semantic and ontological knowledge into the various parts of the web mining process. Indeed, when there is not enough usage data in order to extract useful patterns related to certain categories, or when the website content changes and new pages are added but are not yet included in the web log then the usage-based personalisation can be insufficient. The incorporation of information related to the content and/or the structure of the website provide a way of overcoming such problems, thus improving the whole personalisation process (Markellou et al., 2004). For these reasons and since the frequent updates of the learning content is part and parcel of most modern web-based learning environments, the pilot system that has been developed uses an underlying ontology structure.
3 An adaptive system for supporting online learning communities

It is evident that the immersed web technologies appear significantly promising for implementing online learning communities (Eleuterio et al., 2000; Stojanovic et al., 2001). This section describes the implemented pilot e-learning system, in order to examine the deployment of adaptation mechanisms for delivering personalised views to the members of an online learning community. The overall system architecture and details on its design, implementation, as well as the full set of supported functionalities can be found in (Sirmakessis et al., 2003; Rigou et al., 2004; Rigou, 2004). In brief, the objectives of the pilot system can be summarised as follows:

- Extraction of community knowledge and experience from the recorded personal learning history of the community learners.
- Combination of the extracted knowledge with the content and structure of the repository learning material; the domain expertise and didactic experience of the community tutors; and the activity level of each learner.
- Dynamic production of personalised system views.
- Delivery of personalised system views to each community member.

The basis of the system is an ontology that formulates a representation of the learning domain by specifying all of its concepts, the relations among them and other properties, conditions and ‘regulations’ of the domain. The development of the ontology is akin to the definition of a set of data and their structure. In this way, the ontology can be considered as a knowledge base that is used further for extracting useful knowledge and producing personalised system views.

The learning material is organised on a four-level hierarchy comprising modules, skills, lessons, and topics. Modules are made of skills, each skill contains a number of lessons, and each lesson consists of a number of topics. For instance, topic ‘A quick look at a PC’ is the first topic of the first lesson in skill ‘Intro to PCs’ that belongs to the ‘Learning Computers’ module.

Moreover, the ontology depicts hierarchical and semantic relations between the various entities. Such relations can indicate: classification (is_a), constitution (is_part_of or has_part), dependency (is_basis_for or is_based_on), etc. Figure 1 depicts part of the system ontology conveying that:

- a student is a person and studies topics
- a tutor is a person and creates a module, a skill, a lesson, and a topic
- a module has skills
- a skill has lessons
- a lesson has topics.
The ontology was created with the use of Protégé 2000 (http://protege.stanford.edu), a tool developed at Stanford University (Noy et al., 2001). The role of the ontology is to be used as an input for the system in order to extract, combine, and transform the existing (implicit and explicit) knowledge (e.g., material repository content and structure, learning history of each member and his/her activity and background level, tutor’s expertise and didactic experience, etc.) into new forms. The output of the system comprises various adaptation forms for delivering personalised content and coping better with diverse user profiles, preferences, goals, and needs. Moreover, it improves collaboration among community members, helps tutors control and manages better the student community, and supports the creation and classification of new modules, skills, lessons, and topics according to their scope and content.

This section focuses on selected issues regarding the implementation of the adaptive features and the resulting personalised views aiming at upgrading the overall user experience, allocating more power to users and humanising the feeling of belonging to an electronic community. Figure 2 captures various parts of the user interface elements of the system and the way adaptations are delivered.
3.1 Determining system views based on the user profile (administrator, tutor or student)

In the pilot system, the options available in each profile view vary: while administrators are offered the complete set of options and functionalities (in the form of hyperlinks that lead to forms), tutors have a comparatively smaller set of options (since they do not need access to account management options, neither to personal account data). Students on the other hand, can access an even smaller part of options, since they should not be able to interfere in composing new course material or altering the existing modules, neither in determining the underlying recommendation mechanisms. Views are determined using simple filtering and implemented using link hiding (e.g., neither students nor tutors see...
the hyperlink ‘See pending New Account requests’, available to administrators). Users are distinguished as students, tutors, or administrators with each group being served the respective system view (after login):

- **Student view.** The primary component of the student view is the area (IFRAME) where the content of the learning topic is displayed (for assuring presentation consistency the system uses Cascading Style Sheet technology). Students can navigate through topics, lessons, and categories of skills using a hierarchical hypertext structure visible at all times, which indicates the current topic lesson and skill (see item labelled as ‘Structured list of topics’ in Figure 2). Moreover, a hypertext path on top of the area that displays the topic contents allows the user to recall the current position and backtrack one or more levels on his current navigational path. Students may alternatively print the set of topics comprising a lesson using the ‘Print this lesson’ option, which dynamically generates and formats a separate file that includes all included topics, for printing. The assistance options offered satisfy various needs; ‘Get me help’ contains information on the functional features of the system and the suggested learning process, ‘Glossary’ defines topic-specific terms appearing in the learning modules, while ‘Submit a Question’ provides a way for students to ask tutors for clarifications (an automated mechanism posts the questions to a tutor-only area to be answered, with the answer automatically forwarded back to the student) and the ‘Questions and Answers’ page keeps frequently asked or general-interest questions along with their answers. Another communication channel provided (but a one-way in this case) is ‘Announcements’; teachers and administrators create them and all community members have access to them. Two-way synchronous and asynchronous message communication among all community members is established and supported via the ‘Chat’ and the ‘Student Forum’ respectively.

- **Tutor view.** Tutors create and determine the contents and structure of the learning modules and are also assigned complete control over the teaching process through a web interface. More specifically, tutors may upload a new topic and determine its exact positioning, create a new module, skill, or lesson, update the ‘Glossary’ with a new term or provide an additional definition to an existing term, and submit a new announcement. Tutors are also provided with a form for determining the rules for constructing the recommended items that will be placed under ‘Your tutors suggest that you also study …’.

- **Administrator view.** Administrators are responsible for system configuration and maintenance, as well as for managing user accounts. An administrator receives new student account requests. Candidate new students have to fill in an online application form with information concerning their educational level and preferences. Demographic information, such as age, sex, family status, etc., may be used for the statistical analysis of the community members. Applications for new accounts are either accepted or rejected by administrators, who are also allowed to determine the function for calculating the ‘reward’ for each user (meaning the number of stars appearing next to the user nickname, which indicates how actively he participates in the system – refer to Figure 2).
3.2 Visual representation of student activity level

This approach was taken on the assumption that the system should foster a rewarding method for those active participants of the learning process, allowing the positive distinction of certain students by displaying a number of stars beside their nickname and enforcing this way the online sense of ‘self’ within the learning community boundaries (McInerney and Roberts, 2004). More specifically, for each student in the system a record is maintained for storing profile and usage data.

Material coverage $C_{ij}$ of skill $i$ by user $j$ complies with trivial coverage definitions:

$$C_{ij} = \frac{|R_i \cap R_{ij}|}{R_i}$$

where:
- $R_i$ is the number or all available topics in skill $i$ (e.g., all topics in the ‘MS Word’ skill).
- $R_{ij}$ is the number of topics in skill $i$ marked as read in the personal progress of student $j$.

The maximum number of stars (corresponding to available scaling levels along with the actual function that allocates students a certain number of stars) can be determined by administrators. Usage data collected from cookies and server log analysis are currently used to calculate and deliver the adequate number of stars characterising the current user, but can also feature as a quite descriptive source of data for assessing the overall user activity on the part of the tutor. Administrators can tune the calculations to match any didactic scenario of student ‘rewarding’ through visual clues in his/her representation in the system communicational areas. Scenarios may be based on any weighed combination of metrics such as time connected, material coverage, number of messages posted to the Forum, number of questions submitted, etc.

3.3 Using the recorded activity of the student community to suggest further reading

The pilot system provides a progress monitoring mechanism that is kept manually (i.e., students are required to explicitly mark the topics they have already studied). The reason for adapting this approach and not resorting to automatic recording of topics pages visited by each user is that topic recommendations produced using student activity should not be based on all topics a student happened to come by while browsing through the available material but only those that were actually studied. This way we can hope for more qualitative recommendations. The production of recommendations for further reading is based on association rules mining: topics marked as read in the progress of students that have also read the current topic are recommended under the ‘People that read this topic also read…’ section. Association rules (Agrawal and Srikant, 1994; Han and Kamber, 2001) are used to capture the relationships among topics based on cooccurrence patterns observed in the progress records during successive student sessions.

For association rules of the form ‘$A \rightarrow B$’, where $A$ and $B$ are sets of topics ($A$ is the set of topics in the current student’s progress, and $B$ is the set of candidate topics to be recommended to the student), support is defined as:
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\[ \text{sup}(A \rightarrow B) = \frac{\#\text{ progress\ Records\ containing\ both\ } A\ \text{ and }\ B}{\text{total}\ #\text{ of\ progress\ Records}} \]

The support of an association rule refers to the percentage of the progress records (in our case) for which the rule is true.

A certainty measure for association rules of the same form is confidence. Given a set of recorded studied topics A (in each student’s progress), confidence is defined as:

\[ \text{confidence}(A \rightarrow B) = \frac{\#\text{ progress\ Records\ containing\ both\ } A\ \text{ and }\ B}{\#\text{ progress\ Records\ containing\ } A} \]

For example, the association rule:

\{topic ‘How to Cut, Copy and Paste’, topic ‘Selecting Text’\} \rightarrow \{topic ‘Using the Mouse’\} [support=0.02, confidence=0.68]

conveys the relationship that students who read the topic on ‘How to Cut, Copy and Paste’ and the topic on ‘Selecting Text’ also tend (with a confidence of 68%) to read topic ‘Using the Mouse’. The support value represents the fact that the set \{topic ‘How to Cut, Copy and Paste’, topic ‘Selecting Text’, topic ‘Using the Mouse’\} is observed in 2% of student sessions recorded in their respective personal progress.

Association rules mining typically identifies URI references recorded in server logs on a per-session basis and requires log analysis in order to derive sessions/transactions and then references to URIs of interest, but in our case the personal progress provides a more secure (since we indeed want to recommend topics actually studied by other students and not just accessed) and less demanding option (in terms of required processing). Recommendations returned to the user depend on the minimum support and confidence values set by administrators, as well as the preferences set in the current user account data (a user may change the maximum default number of recommended topics or even disable recommendations, at all). Moreover, topics to be recommended are further filtered based on their semantic classification stored in the ontology. This way, a topic within the same lesson as the topic currently viewed, is recommended with a much higher probability than a topic in a different lesson, or even a different skill. Topics are internally annotated (RDF file) with a short description which is displayed in the recommendations list for the students’ convenience.

3.4 Using the tutors’ expertise to suggest further reading

A second set of recommendations is assembled and placed under ‘Your tutors suggest that you also study...’ and contains topics recommended based on contextual topic associations defined by tutors. Tutors use the domain ontology every time they upload a new topic for defining links towards existing topics that relate to the concepts and terms encountered in the new topic. These connections are then used by the system to set up the recommendations list for further reading that will be delivered to the students that will study the new topic. Again, students can determine whether there will be a recommendations list on their system view and how many topics will be on that list. Naturally, both types of recommendations (generated from the student and the tutor community) exclude from their list the topics already marked as read by the current student.
4 Concerns and open issues

This section discusses some of the prevailing concerns and open issues that were raised during the design and implementation of the pilot system. Unfortunately, there are no easy answers or solutions to these issues but it is important that designers of similar applications bear them in mind when making the big and small decisions on how to implement and deliver personalisation in an online learning community:

- Construction of ontologies for learning. The creation of an ontology is not a trivial or straightforward process. It requires the involvement of experts, who have an abstractional thinking and deep knowledge of the domain to be described, in order to provide a shared and common understanding of it. The selection and definition of the concepts and the relation between them, as well as the level of detail, are costly and time-consuming task, since the more analytical the ontology is, the more complexity and difficulty it imposes (Wilson, 2004). Furthermore, it often happens that the ontological decisions embodied in the design of the data repositories may not correspond to those of the user. This is the case for many e-learning environments, where the differences of the various notions may often be indistinguishable. A solution to this can be the use of multiple ontologies, one for each user profile, instead of a single universal ontology.

- Speed. Web users have a certain (and low) tolerance to delays as concerns the time required from when they click on a link or type a URL to the time the requested page appears (or starts appearing) on their browser window. Web-based learning environments and especially learning communities (which impose further demands on speed due to their communicational components) should not suffer from big delays that could cause abandonment. The underlying mechanisms, computations, recorded data, and mining tasks that are part and parcel of a typical adaptation/personalisation process should not jeopardise low response times. This means either that part of the process is executed offline or that special algorithms, structures, and configurations assure fast online operation.

- Effectiveness. Adaptive approaches to web applications impose demanding space and computational requirements. Thus one has to wonder if the specific application needs such mechanisms and to what degree; which parts should be dynamically adapted and what types of data should be recorded; how these data are to be processed and what kind of techniques should be applied on them in order to produce adaptations; and after all, is it really working? The effectiveness of adaptations and their accuracy (did the system succeed in serving user needs and preferences, or were the recommendations interesting for the user?) is part of a bigger issue researchers refer to as adaptation evaluation. This still remains a ‘grey’ area.

- Loss of control. The problem of loss of control is observed in situations where the user is not in control of when and what change occurs and it is referenced in literature as a usability degrading factor. Personalisation, with all the automated adaptations it ‘triggers’ transparently, is a blessing only if the user is given the option to control what and how it is adapted automatically. This way, locus of control remains where it should be: at the user side.
• **User intrusion.** It may be caused by either explicit profiling (when the user is asked a number of questions for initialising the corresponding profile) or by the wrong way of delivering personalisation features (for instance if recommendations for further reading appear in a new window that is placed on top of everything else and stays there until the user closes it). Interface designers should ensure that systems, which provide personalisation features, treat users and their attention with respect (especially when it comes to learning environments where it is imperative that student attention is not be distracted).

• **Privacy.** As an alternative to explicit (and intrusive) profiling or in combination with it, adaptive systems try to collect as much data as possible from users, usually without user’s initiative and sometimes without his/her awareness. Such systems are striving to identify the user, record the user’s online behaviour (in as much detail as possible) and extract needs and preferences in a way the user cannot notice, understand, or control. This situation brings up the invaded privacy hazard. A number of protocols and standards are already in place for protecting the user’s right to privacy with the big majority of them (P3P, OPS, CPEX, PIDL and more) designed for the e-commerce domain.

5 Conclusion

The formation of online learning communities promotes online learning. This paper argues that yet another factor that (when combined with the sense of belonging to a community) may greatly upgrade the online learning experience and diminish the high dropout rates is the provision of adaptive features that personalise the learning experience and tailor it to each individual user (or group of users). Web usage mining combined with semantic information through the use of an underlying ontology is able to derive the valuable traces of the everyday practice of community members. Using this accumulated knowledge we can deliver personalised web experiences that enhance learning online. In this framework, a pilot system that experiments with the application of a set of adaptation techniques incorporated in a web-based learning environment has been described and a number of potential restrictions and concerns regarding the use of web mining and personalisation in general, in the domain of online learning and learning communities have been discussed.

Concluding, web-based learning demonstrates great opportunities, but it also presents great risks. The presence of anytime, anywhere learning suggests that it can be a popular alternative for many students who do not have the opportunity to attend traditional face-to-face classes or who prefer the independence of this method of education. Regardless though, of how many and how intelligent techniques technology offers for delivering online teaching and learning, or how sophisticated, integrated and highly customisable e-learning systems become, the fact remains that as the novelty effect of online courses wears off, online learners may become less tolerant of poor online course experiences (Rovai, 2002). To be successful, experienced instructors are required to have the knowledge and skills to elicit student satisfaction and the creation of the feeling of being members of a virtual community is a strong force towards this end. For shaping communities out of a group of people that participate in the same e-learning environment,
developers and users must plan, guide, and mould communities to support the people in them. Like twentieth-century town planners and architects, community developers can profoundly shape the online community landscape. Attention to sociability and usability will be a big step along the way to ensuring development of successful online communities.

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