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Making sense of Communities of Practice at the University Level: Connecting Academia and Industries

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Abstract: High-tech entrepreneurship education is the challenge of connecting practical university teaching with well-known concepts of life long learning in companies. New kinds of communities of practice emerge from these efforts. We present experiences made with a course in applied computer science which was based on this concept. In the “Entrepreneurship and New Media” lab, project teams of students worked with two start-up companies. The student teams were connected to each other and to their supervisors in academia and practice by means of a community system. We present a first qualitative study which evaluates the didactical concept and use of the deployed community system.

Keywords: Communities of practice, social capital, practical university teaching, high-tech entrepreneurship, evaluation

1 Introduction

Innovative and knowledge intensive start-ups have a positive impact on the economic development of regions by fostering the structural change and the dynamics of employment rates. Bearing this in mind, knowledge from universities should be deployed more effectively for future entrepreneurial activities of students. By now, only a small amount of students start a new enterprise after having worked 8-15 years in industry [ScK196, Alba98, Moog00]. Universities should make students more aware of their entrepreneurial potential and qualify them for successful entrepreneurship.

Entrepreneurship cannot be stimulated and taught by transferring knowledge, but several didactical concepts are desirable in one module: economic and legal basic knowledge (e.g. legal forms, financing, resource management), mediation of role models through invitation of successful (or less successful) entrepreneurs, practice oriented teaching (e.g. business plan competitions, role plays, group-oriented interdisciplinary task solving), networking between entrepreneurship oriented students (e.g. teambuilding events), and mediation within social networks (e.g. venture capital and business angel networks, national or regional trust boards, domain experts). There are a lot of inspiring examples for universities having such a comprehensive approach in entrepreneurship teaching, like the MIT Entrepreneurship Lab [Robe91]. In Germany, we have good prerequisites to connect academic's initiatives in entrepreneurship with the vivid local start-up scene by relying on the strength of different learning approaches in different institutions and combining them with modern technical infrastructures for knowledge sharing and communication. In a 50 miles distance to the RWTH Aachen, for example, a dozen of so-called technology parks has been established with 500 new companies and with more than ten thousand employees in the last 15 years, partly based on successful entrepreneurial courses like "team-oriented development of marketable computer science products" [JJSt98].

The major challenge is the combination of practice-oriented education at universities with concepts of apprenticeship learning within companies to establish such endeavours on a regular basis. The potential of digital media to overcome time and space barriers supports the knowledge transfer between universities and actors within companies. But again, we have to develop appropriate didactical concepts to connect practitioners with learning activities at universities.

We want to present an in-depth analysis of an ongoing computer-supported course developed to enhance the cooperation between students and practitioners. The course "Entrepreneurship and New Media" now established at two German research universities tries to create shared learning experience while solving a complex task. In the course, project groups consisting of students of computer sciences work each on a concrete project task defined by a start-up company. The course is accompanied by a series of lectures introducing entrepreneurship and media relevant topics by researchers and practitioners. During the whole course computer-based community systems are deployed to facilitate communication and document sharing between the participants.

2 Learning as identity building, social capital building and shared experiences in communities of practice

Traditional university teaching based on knowledge transfer mainly by means of lecture was criticized from a theoretical and practical point of view [CBNe89, JoMa90]. Thus, recent scientific approaches favour constructionist and socio-cultural concepts of learning. Based on the work of Vygotsky [Vygo62], Piaget, and Bateson [Bate73] learning is seen as an active, constructive and social process. Learning means not just transferring knowledge. Learning is rather the permanent construction of knowledge, based on former experiences. Hence, learning is linked to real world problems [LaWe91].

In the last decade constructionist theories of learning played an important role in the development of new computer-based learning designs [DuJo92]. In the following, we will explore the role of socio-cultural theories of learning and link them to newer theories of social capital in economic and social theories. Socio-cultural learning theories take learning as a collective process which is linked to specific contexts of action. Knowledge emerges in communities of practice by discursive assignment of sense. Communities of practice (CoP) [Weng98] are characterized by common conventions, language, tool usage, values, and standards. The development of a common practice which defines the community integrates negotiation of meaning among the participating members as well as mutual engagement in joint enterprises and a shared repertoire of activities, symbols, and artefacts. A community practice is inseparable from issues of (individual and social) identity. Identity is mainly determined by negotiated experience of one's self in terms of participation in a community and by the learning process concerning one's membership in a CoP [Weng98, pp. 145]. The approach combines the "two sides of the medal" of community participation: the social practice of the community as a collective phenomenon and the identity of its members as an individual one. The aggregated resources an actor can gain from these individual learning processes are often labelled with the metaphor of human capital.

Recently, the concept of human capital has been complemented by the one of social capital. Bourdieu [Bord85] defines social capital to be the aggregate of actual or potential resources which an actor can derive from his permanent network of more or less institutionalized relationships or from his social reputation. Like with human capital, it takes the individual quite some efforts (investments) to build up social capital. Social capital is assumed to help individuals to make use of their human capital. Often the creation of human and social capital is interrelated. For instance, when going to an excellent university, students build up a social network which helps them learning and adapting during their whole professional life. On the other hand, given social networks allow for

(cooperative) learning opportunities. Coleman [Cole88], Burt [Burt92], Cohen und Prusak [CoPr01], Huysman and Wulf [HuWu04] have contributed to the discussion in the Anglo-Saxon literature about social capital and knowledge management. Putnam [Putn93] defines social capital as a feature of a social organisation, as networks, norms, and trust to ease reciprocal actions and cooperation. For this reason it is important to have a closer look at the formation of social capital. We want to investigate how social capital complements individual capital in enabling collective learning processes in building high-tech start ups. High tech entrepreneurship is an interesting area to investigate learning processes because the actors have to develop their skills continuously. This is due to the quickly changing nature of the relevant technologies and the dynamically evolving markets. Following this considerations entrepreneurship teaching has been developed rapidly in the US in the last 25 years. Most of the competences needed for founding a company are teachable and can be developed in courses. [Neub98, p. 312]. In the US there are 1500 colleges and universities offering courses in entrepreneurial education. More than 100 active, university affiliated entrepreneurship centers and 270 endowed chairs exist.

The following factors are possible sources for social capital [PoSe93, Port98]: value injection, reciprocity transactions, bounded solidarity, and enforceable trust. A study [FuMe03] conducted with interview material provided by two of the authors disclosed four types of networking mechanisms in the entrepreneurial scene around the MIT:

- Type 1: Matchmaking Events such as informal beer-and-pizza meetings or formal dinners which lower the threshold to contact possible business partners.
- Type 2: Local affinity groups such as dormitories, courses and research labs (peer group effect).
- Type 3: Personal reputation networks gained through personal expertise and experience.
- Type 4: Restricting interorganisational regulations by means of intellectual and social capital management through university and venture capitalists.

These four types of networks are related to each other. For balancing lock-in syndromes, transaction openness, value injection, trust, and solidarity, all four networking mechanisms are needed. For a closer look we refer to [FuMe03] and [JKMa03]. Our course was designed following the theoretical considerations discussed above, trying to gap the cultural differences between Germany and the US.

3 Course Structure

The course “Entrepreneurship in New Media” was offered first in winter term 2001/ 2002 at the RWTH Aachen. Based on the theoretical foundations sketched above and our experiences in prior courses, we conceptualised it as shown in Figure 1. A major part of learning was supposed to happen by legitimate peripheral participation in the community of practice of the start up companies (Type 2 and 3). Students should acquire practical knowledge and experience while solving complex and authentic tasks. The complexity and authenticity of the task was thought to be an enabler of the community building process, defining clear boundaries of inclusion and exclusion. Group-oriented learning processes, especially among the student teams and between them and their academic advisors should be facilitated by a community system. Thus, the instructors put task relevant learning materials on the community system. Additionally, instructors were available for consultancy and supervision. The weekly series of lectures supported the students’ reflective processes related to their tasks. Moreover, it was supposed to work as a forum of discussion among students and guest lecturers from industry and academia. This forum was designed to offer opportunities for matching and so called “contact sport” (Type 1). Therefore, it was also accessible for students not participating in the lab groups. While initiating learning processes among the students the course design supported the knowledge transfer from academia to industry as well. Non-disclosure agreements and intellectual property handling was exposed to the students and industry in the introduction session (Type 4).

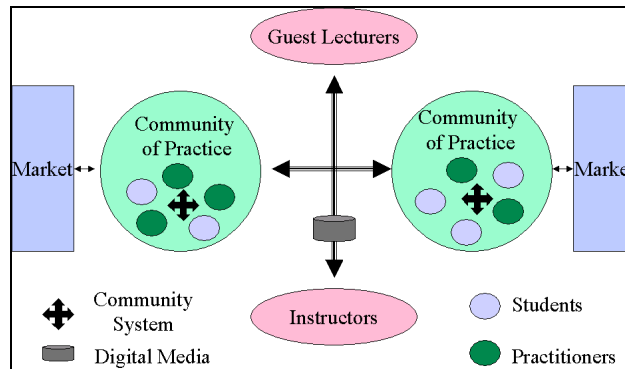


Figure 1: Design of the computer-supported course “Entrepreneurship and New Media”

In an introductory meeting the interested students were introduced to the basic concept of this type of courses; the tasks were presented briefly and project groups

were formed. Additionally, an introduction to software engineering methods took place in two half-day seminars. In the first year this was "Unified Modelling Language (UML)" and "User-oriented Software Engineering", later we switched to Extreme Programming which is thought to be more appropriate for short term projects in rather small teams. In the introduction meeting the students chose one of the presented project tasks and formed appropriate working groups (Labs). One of these project groups was named "Lab1: Web-based Marketing Strategy". The task of this group was to develop a web-based marketing strategy for a newly founded research institute. Another project group "Lab 2: E-Commerce-Platform for Antique Furniture" cooperated with an art historian who intended to start up a company. In the following week, the lab members had first meetings with the entrepreneurs to gather information about their objectives, projects and working methods. The project groups and tutors compiled and agreed upon a concrete project plan. With regard to the accompanying lecture, speakers from academia and practice rotated. The external speakers were not primarily scientists but entrepreneurs. These experts contributed their experiences from practice to the course. So the students got perspectives from management consultants, venture capitalists, software developers and personnel specialists who supplied topic-referred empiric reports and were available for discussions and critical inquiries. In two lab reviews the project groups mutually presented each other their results and discussed the further procedure together with the lecturers and experts. So these review sessions also served to exchange experiences and offered the possibility to benefit from the progress and findings of the other project group. At the end of the term, students, lecturers and entrepreneurs had a final meeting. The project results were presented and discussed by the project groups.

4 Technical support and evaluation of the course

Digital media use in university level teaching is becoming a well-funded research area [JoMa92, BAR*93, JDP*97, Schu97, UeWu00]. The major challenges are to develop adequate technical functionalities to support individual and group learning processes as well as to embed these applications into innovative didactical concepts. Recent fallacies, like many endeavours of tele-lectures, support our claim that digital media are as useful as their relation to innovative didactical concepts. As we already mentioned, the lecture had been supported by using a community system.

The community system "CommSy", which was developed at the University of Hamburg, is a web-based cooperation platform that provides different working areas in which libraries with (specialized) literature, black boards for announcements and thematic discussion forums can be used [JKP02, JaB102]. In the following years the Aachen course switched to the BSCW system [Appe99]

for which the local support was better. RWTH computer science students know the system because it is used frequently in undergraduate seminars and labs. Especially for the lectures, a work area named “StartUp-CommSy” was created. The community system supported cooperation within and between working groups. Moreover, the system had been used as a knowledge-archive for lectures. There, lecture materials have been published regularly on the net. In order to find these materials, the system offers various retrieval functions. As to support effective learning processes, students keep their account and can therefore use the cooperation infrastructure for further cooperation in the course of their studies. This could be a way to encourage learning processes through access to such a community system even if students have already left university.



Figure 2: Startup-CommSy, News, Events and working media

Therefore, we asked the project groups to “tidy up” their virtual project room in the last phase of their project in order to refine their results and to place them at the disposal of a public accessible space (“show-case”-functionality) for project groups of following students.

We used different qualitative examination methods for the evaluation of the lecture. The lecturer composed a protocol of several lectures which stated progress, discussion with students and other characteristics. Interaction within the community system was recorded as well as email-exchange between students and several cooperation partners. Finally, a 45 minute lasting open discussion took place between students, lecturer and cooperation partners where especially students were asked to give feedback concerning concept and structure of the lectures. The course of discussion of the workshop was recorded. After the term, seven partly-structured interviews with five students, one teacher and one

entrepreneurial supervisor have been made. While the above mentioned inquiries had been carried out by teachers, the interviews were lead by a scientist who was not involved in the lectures. In the interviews which lasted between 30 and 180 minutes, students were first asked about their personal background, their background of education and their motivation for participating in the lecture. After that, students were questioned on personal impressions and assessments of the lecture and its single components. Students were also asked to suggest improvements. In the interview, lecturers were questioned on their personal background and high emphasis was placed on assessments of the lecture-components held by them.

5 Results

After a highly frequented introduction to the lecture, the seven students who were interested in the project work have been gathered during the first week in two project groups. The number of members in the first project group reduced itself to two German students in computer science diploma, because one student had dropped out. The regulations for graduation did not allow her to include this course. The second project group consisted of four foreign students. One of these students dropped out during the first part of the term due to a longer stay in hospital. During the term, the lectures had regularly been attended by approximately 15 to 20 students. This shows that students are interested in entrepreneurial topics even in engineering and science faculties. Each of the two blocked lectures on methodical basics took one day. They were only frequented by those who participated in the project groups.

From a result-oriented perspective, the course can be rated as successful. Both project groups developed full functional technical solutions for the complex tasks. In project group I, a content management system for a web site could be developed which includes, besides presentation of the research institute and some of its projects, discussion forums, a small authoring system and graduated access permissions for various target groups. Lab group 2 realised a prototype of a virtual community system with a database for antique furniture with the usual retrieval and communication facilities.

In the following, the course will be presented and discussed from the perspective of social-cultural learning theories. Therefore, we investigate to what extent the establishment of communities of practice and social networks had been successful and which factors had influenced its success or failure, respectively. Thus, we now further investigate each of the different dimensions of creation of communities of practice in the teaching concept.

5.1 Communities of practice between students and industry

The establishment of communities of practice between employees of a firm and students has to be regarded as less successful with respect to both of the project groups. While knowledge was created on both sides it turned out that basic computer science competence and at least roughly established organisational procedures are important for supporting community building. While the research institute had certain competencies within the range of web design and web-based marketing, the task setting of the founder of the internet portal for antique furniture was defined more complementary to the own competence. Restrictions of electronic communication make a legitimate peripheral participation at the practice community more difficult.

Incompatible social-cultural backgrounds and incommensurable mutual expectations proved to be problematic for the establishment of community practice between start-up companies and lab groups. In the first project, there were cultural divergences which made the creation of a CoP between the groups of students and the employees of the research institute more difficult. The employees of the research institute saw the students as technically skilled but also very limited in their motivation. They assumed that the student's main goal was just getting a good mark. The research institute assumed that lacking motivation lead to attempts of a restricted problem definition to work on in the lab. In the redesign of the course a much more inclusive specification process was established by using CRC cards in an Extreme Programming style [Beck99].

6.2 Communities of practice within the lab groups

The social ties developed in the lab group themselves were much deeper and much more focused on common work practice and the ties between students and entrepreneur as expected from theory (Type 2 vs. Type 3). The Lab 1 group consisted of two students not knowing each other. One of the students was an experienced programmer on industry level while the other was without practical experience in programming. But his willingness to learn was appreciated by the other student:

“The main system and much implementation work was done by me, caused by his lacking knowledge of Perl. We've both coded roughly the same amount of hours. The forum was completely done by him in complete. I have to admit that I wouldn't have created such a nice forum. I'm very pleased with him.”

The Lab 1 group had a more complicated community-oriented learning process. There were not only differences in coding experience but also in team-building capability. One of them had dropped out in the middle of the term. Also one student had paused for several weeks due to a serious illness but his group-

oriented work style and his coding experiences saved the success of the lab finally. After his return, social ties were strengthened and lab work progressed sufficiently to finally make the lab a success. In both lab groups learning progress was made by common work of the engaged students. Especially, in Group 1 it is evident that industry gained experience in CoP can be used in university level courses. Professional identity gained in university and professional practice helps shaping the design of the student CoP.

5.3 Instructors as facilitators

Instructors play a key role in the chosen design of the course. They are responsible for acquiring start-up companies suitable for the student's needs, they select the students and support their team-building processes, they invite the external lecturers and organize lecture series, they prepare and perform the tutorials, they organize and supervise all the reviews, and finally, they advise the lab groups as facilitators in the dynamic learning processes. Thus, preparation of such courses is very time consuming. Supervision and review organization were clear critique points claimed by students while instructors are in a dichotomous role. On the one hand, they are moderators within the CoP, on the other hand, they assess the individual performance of each student. Fruitful discussions among facilitators and students happened when the formal review process was finished. This is a clear hint that the implementation of innovative didactic concepts is always contextualized in existing cultures of teaching and learning [Weng98].

5.4 Use of the community system

Both lab groups used email and telephone quite frequently and meet several times a week face-to-face in the lab rooms of the computer science department. The community system was used by the instructors to distribute the learning materials of the lectures. Group 1 used the system to store occasionally project results. Furthermore, references to relevant literature and some announcements were put on the system by the instructors and by one of the entrepreneurs. Analyzing the reasons for the sporadic use of the systems we found several reasons. First, the group size of the lab groups was quite small. The coordination overhead was humble to that effect. The possibilities to meet physically were quite good lowering the system use again. In the interviews the students stated that the grade of interaction in the system was too low because the "critical mass" of people involved was not reached by the course. In redesign, the instructors decided to motivate the students in using the system more frequently by introductory tasks.

6 Conclusions and Outlook

Socio-cultural learning theories stimulate the design of practical entrepreneurship courses in applied computer science. We have discussed a digital media supported lab course accompanied by a series of lectures different from classical industrial internships and from university based group work. Both, networking on a technical and a on social level offer new opportunities for university level learning. The concept discussed was evaluated in the course “Entrepreneurship and New Media”. Results showed that the learning mechanism of legitimate participation was fulfilled. In the core of both groups, high intensity learning CoP emerged. Design flaws, cultural as well as professional diversities, and imponderability of reality limited the success without discrediting the overall approach. The implementation of such concepts depends deeply on the changing role of university level instructors and the selection of suitable community systems. These are very new duties and need developed social competencies in fostering trust and team spirit. In the following years the redesigned course whose improvements are partly mentioned got even more successful in terms of social networking and economic impact. After three years of operations we can conclude that we are well connected with the local entrepreneurial community. As a pay back to our investments in social capital, our institute in the meanwhile easily gets access to all necessary information, events, and other courses in Aachen’s entrepreneurial scene. We work together with the local entrepreneurship center (Gründerkolleg) and with local initiatives like the AC² business plan competition. Nowadays it is rather easy to acquire new companies and students for the ongoing lab courses. So the design of our course has offered an interesting learning experience for students. Moreover, it contributed to more dense social networks between academia and local industries.

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References

- [Alba98] Albach, H.: Unternehmensgründungen in Deutschland. Potentiale und Lücken. Wissenschaftszentrum Berlin. Diskussionspapier FS IV 98-1. Berlin, 1998
- [Appe99] Appelt, W.: WWW Based Collaboration with the BSCW System. Proc. SOFSEM'99, Milovy, Czech Republic, LNCS 1725, 66-78, 1999.
- [Bate73] Bateson, G. Steps to an Ecology of Mind. Paladin Books, 1973.
- [Beck99] Beck, K. Extreme programming explained: embrace change, Addison-Wesley, Boston, 1999.
- [Bord85] Bourdieu, P.: The forms of capital, in: J.G. Richardson (ed.): Handbook for Theory and Research for the Sociology of Education, 241 – 258, 1985.
- [BAR*93] Brown, A. L., D. Ash, M. Rutherford, K. Nakagawa, A. Gordon und J. C. Campione: Distributed Expertise in the Classroom. In Distributed cognitions – psychological and educational considerations, G. Salomon (ed.), 188–228. Cambridge University Press, 1993
- [CBNe89] Collins, A., J. S. Brown und S. E. Newman: Cognitive Apprenticeship: Teaching the Crafts of Reading, Writing and Mathematics. In Knowing, Learning, and Instruction, L. B. Resnick (ed.), 453–94. Hillsdale: Lawrence Erlbaum Associates, 1989
- [DuJo92] Duffy, T. M. und D. H. Jonassen, Eds. Constructivism and the Technology of Instruction: A Conversation. Hillsdale: Lawrence Erlbaum Associates, 1992
- [FuMe03] Funken, C., Meister, M.: Netzwerke als Singles Bars, Affinity groups und interorganisationales Regime. Zu einigen Schwierigkeiten, das soziale Geschehen von Unternehmensgründungen informationstechnisch zu unterstützen. In: Christaller, Th.; Wehner, J. (Hg.): Autonome Maschinen. Fink Verlag, Paderborn, 2003
- [HuWu04] Huysman, M; Wulf, V. (eds): Social Capital and Information Technology, MIT-Press, Cambridge MA 2004 in press
- [JJKP02] Jackewitz, I., Janneck, M., Krause, D., Pape, B., Strauss, M.: Teaching Social Informatics as a Knowledge Project. IFIP-Konferenz SECIII, Dortmund, 2002
- [JJS98] Jarke, M.; Jäger, L.; Steffenhagen, H.: Früh übt sich, wer's zu etwas bringen will. Teamorientierte Entwicklung marktfähiger Informatikprodukte - Erfahrungen mit einem Spin-Off Kolleg an der RWTH Aachen Handbuch Hochschullehre, C2.5, November 1998, 1-36.
- [JKMa03] M. Jarke, R. Klamma, J. Marock: Gründerausbildung und Gründernetze im Umfeld technischer Hochschulen: ein wirtschaftsinformatischer Versuch. In K. Natusius (ed.): Zu den Wirkungen des regionalen Kontexts auf Unternehmensgründungen. EUL-Verlag, 2003, pp. 115-154
- [JaBl02] Janneck, M.; Bleek, W.-G.: Project-based Learning with CommSy. In: Proceedings of CSCL 2002
- [JDP*97] Jonassen, D. H., D. Dyer, K. Peters, T. Robinson, D. Harvey, M. King ; P. Loughner: Cognitive Flexible Hypertext on the Web: Engaging Learners in

- Meaning Making. In Web-based Instruction, edited by B. H. Khan. Englewood Cliffs, 1997.
- [JoMa90] Jonassen, D. H. und H. Mandl, (eds). Designing Hypermedia for Learning. Berlin: Springer, 1990.
- [LaWe91] Lave, J.; E. Wenger. Situated Learning: Legitimate Peripheral Participation. Cambridge University Press, 1991.
- [Moog00] Moog, P.: Human Capital as key success factor for small businesses. In: RENT Conference Proceedings. Prag, 2000, S. 157-165.
- [Neub98] Neubauer, H.: Lernziele als Bausteine in der Unternehmergebung. Überlegungen zur Förderung unternehmerischen Handelns im Rahmen der Ausbildung von Unternehmensgründern, in: Pleitner, H.J. (Hrsg.): Renaissance der KMU in einer globalisierten Wirtschaft. Rencontres de St. Gall., St. Gallen, 1998, S. 303-322.
- [Port98] Portes, A.: Social Capital: Its Origin and Application in Modern Sociology; in: Annual Review of Sociology, Vol. 24, 1998, 1 – 24.
- [PoSe93] Portes, A.; Sensenbrenner, J.: Embeddedness and Immigration: Notes on the social determinants of economic action, in: American Journal of Sociology, Vol. 98, 1993, S. 1320 - 1350
- [Robe91] Roberts, E.B.: Entrepreneurs in high technology: Lessons from MIT and beyond. New York, Oxford, 1991.
- [Schu97] Schulmeister, R. Grundlagen hypermedialer Lernsysteme: Theorie - Didaktik - Design. 2nd edition, Munich, Vienna: Oldenbourg, 1997.
- [ScKl96] Schulte, R.; Klandt, H.: Aus- und Weiterbildungsangebote für Unternehmensgründer und selbständige Unternehmer an deutschen Hochschulen. Bonn, 1996
- [UeWu00] Uellner, S. und V. Wulf (eds.): Vernetztes Lernen mit digitalen Medien, Proceedings der Tagung D-CSCL 2000, Physica, Heidelberg 2000.
- [Vygo62] Vygotsky, L. S. Thought and Language. Cambridge: MIT Press, 1962.
- [Weng98] Wenger, E. Communities of Practice : Learning, Meaning, and Identity. Cambridge University Press, 1998