SCIPAS Report No. 2

Success and Failure in Starting Science Shops

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Study financed by the EC-DG XII programme
Improving the Human Research Potential and the Socio-Economic Knowledge Base(IHP)
Strategic Analysis of Specific Political Issues (STRATA)
(HPV1-CT-1999-00001)

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Title: Success and Failure in Starting Science Shops
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Serie: SCIPAS report nr. 2
Pages: 81
Date: July 2001
ISBN: 90-5209-115-3

Publisher:
Science Shop for Biology, Utrecht University
Padualaan 8
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Cover design : Norbert Steinhaus
Lay out: Caspar de Bok

Acknowledgement

This report gives the results of workpackage 2 of the project called SCIPAS (Study and Conference on Improving Public Access to Science through science shops) which has been awarded financial support by the European Commission through the contract HPV1-CT-1999-00001 under the 5th Framework Programme of the European Community for Research, Technological Development and Demonstration Activities (1998 to 2002), and its specific programme 'Improving the Human Research Potential and the socio-economic Knowledge Base' ('Strategic Analysis of Specific Political Issues').

We sincerely thank the other members of the SCIPAS consortium and our scientific contact officer at DGXII, as well as those who attended the conference 'Living Knowledge' in Leuven, 25 - 27 January 2001, for their support and valuable comments. A special word of thanks goes out to Richard Sclove for conducting the interviews in France, and to everyone that shared information with us, by phone, fax, letter, e-mail and in person.

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July 2001

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Executive Summary

This chapter of the SCIPAS report outlines the results of a comprehensive investigation into the history of science shops in 16 countries from Europe, North America, Asia, Australia and Africa. While the survey cannot claim to be exhaustive, it certainly is to date the most comprehensive overview of this sector.

Science shops exist in a wide range of shapes and sizes, but they share a common desire to extend research support to socially marginalised groups in the form of equitable partnerships between the social 'client', the science shop, and any other parties engaged in the activity. Broadly speaking, science shops exist in two forms: those that are embedded within other organisations (mostly universities), and those that are not organisationally linked, existing as independent initiatives in the form of non-governmental or community-based organisations (NGOs and CBOs).

Most science shops are university-based or linked (either at the Faculty level or as a central university office), the most developed system existing in The Netherlands. These science shops are often integrally involved in the academic activities of the university, by mediating or performing research. Within the US, there are many NGOs and CBOs that fall into the category 'science shop', but they are most usually referred to as Community Based Research (CBR) centres, their defining feature being their methodological approach to community based research.

The survey explores in detail the history and experiences of the start up of these organisations. The analysis is performed in the context of a model that had previously been developed in order to assess and explain the factors leading to success or failure of individual science shops. We have extended this model and applied it in detail to five of the cases reported in this chapter. The study involved literature reviews and interviews with persons linked directly to each of the cases.

The analysis reveals that the active support of each of four agents (or actors) is a necessary condition for the successful implementation and continuation of a science shop. These four actors are:

- Clients (societal demand for research support);
- Scientists (a supply or source of research support, e.g., students or research staff);
- Institutions (a host or supportive structure, such as university);
- Science shop staff (individuals enacting the science shop 'philosophy').

Clearly, the four agents listed above exist within specific historic socio-political, cultural and scientific environments or contexts; these considerations were also factored into the model in order to gain a fuller understanding of the factors determining the sustainability of a given science shop (see fig. 1).

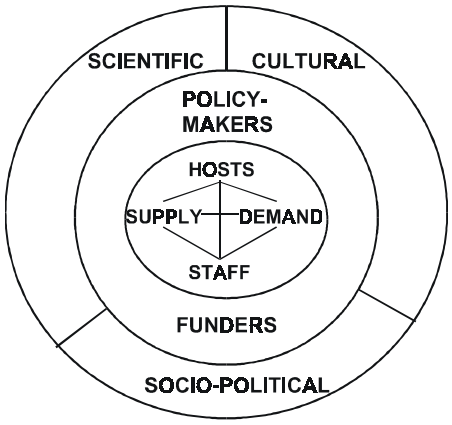

Figure 1. Science Shop in its surroundings.

Science Shops in the European Union

Netherlands

The Dutch system of science shops dates back to the 1970s and was brought to life by critical university staff and students. By the early 80s, all Dutch universities had one or more science shops, established as university departments with paid staff. Important in this development was a 1983 memorandum from the then Minister of Education stating that universities should provide 2-5 full-time job equivalents to a science shop. The only shop not linked to a university had to close soon after its establishment for a lack of supply of research capacity.

In the Netherlands, demand (e.g., in the form of requests from active, non-professional environmental groups) and supply (engaged students and staff) were present in the 1970s. The latter started science shops voluntary and their momentum prevailed to convince universities (as hosts) and the Minister of their value. Environmental organisations and Unions actively supported the science shops. As time progressed, science shops professionalised along with their clients, and adapted to emerging themes continuously.

The circumstances facing universities in the 1990s, by comparison to those of the 1980s, have brought with them new demands that pose challenges to the continued existence of science shops; these factors include commercialisation of higher education and research, decreasing democracy at universities, and tighter study-schedules for students. As a result, two universities have closed down their central science shop office, and two faculty shops were also closed. Nevertheless, there are currently over 30 successful science shops at the Dutch universities, and these cover the country geographically and topically.

Information on the Dutch science shops, published in a range of journals throughout the 1970s and 1980s, led to a first wave of interest from abroad. Similarly, the development of the Internet has brought about a second wave of (renewed) interest in the 1990s.

France

In the early and mid-1980s there were as many as 16 science shops in France, organised into a strong National Association. Science shop work had started from project groups of critical scientists who had learned about the Dutch science shops, but students were not involved.

While the National Association received funds from various governmental sources, these had to be divided among a growing number of shops. Moreover, the absolute amount of government funding reduced significantly as well, already in the second year. Scientists at national research laboratories (such as the CNRS) were allowed to spend some hours of their work on science shop questions (providing a supply of research), while universities allowed the use of offices, though they did not actively support science shops. Co-ordinative or administrative tasks of science shop staff were not rewarded.

The shrinking budget problem forced science shops to alternate between doing pilot projects (to convince other actors of their value) and raising structural funds (for sustainability). Demand for science shop services came predominantly from individuals who had unrealistic expectations of science, and turned away when there were no instant solutions to their problems. The French science shops were not in regular contact with the by that time more experienced Dutch science shops.

It would appear the French science shops never had the time to prove themselves: tapping into student research could have increased supply; universities could have supported science shop co-ordination, and instead of diluting their efforts into individual requests, the shops could have concentrated on links to organisations of clients. This would have enabled pilot-projects to demonstrate the value of science shops, and allowed the shops more time to create linkages to civil society organisations on research issues.

Germany and Austria

Critical scientists in Germany and Austria developed both independent (NGO) science shops as well as science shops at universities. Though both were based on the Dutch example, it proved difficult to convince most German universities of the scientific standing of science shops. Both models prospered with the availability of volunteers, but faced continuous budget problems and personnel changes. Some 8 science shops of the approximately 20 that have existed remain: Kubus in Berlin being the largest university-based science shop, the WiLa Bonn being the largest NGO (staff of 30) - the latter can sustain its science shop task by its large activities in job support. In Austria, 4 science shops are still active.

Other countries in the European Union

Belgium had a science shop in Leuven for approximately 7 years, which mostly arose as a voluntary effort of staff and students in the early to mid-80s. In 2001, renewed interest has been shown in Flanders.

In England there emerged a number of alternative technology centres in the early 1980s, but at that time science shops were more difficult to establish given the tighter curriculum program for students by comparison to, e.g., Dutch students. In 1989, the science shop for Northern Ireland started, based on the Dutch example. In Manchester and Liverpool, science shops emerged in the 1990s, these working predominantly with students to do research-internships with civil organisations.

Developments in Denmark paralleled those in The Netherlands. Other science shop initiatives are known – or have at least been mentioned in the literature – in Finland, Sweden, Italy and Spain, as well as in the non-member states Switzerland and Norway. These are not discussed in this report.

Science Shop initiatives in Central and Eastern Europe

In this report experiences in Brno, Czech Republic, and Romania are described. Both are examples of the active Dutch 'export' of the science shop method.

Czech Republic

The Chemistry Shop Utrecht (NL) initiated the Czech project in 1994 based on contacts with people involved with Eastern European environmental issues. Science shops were seen as a method to develop local multi-disciplinary problem-solving capacity for the environment.

The project to introduce science shops was divided in four phases:
1. Choice of a city;
2. Theoretical introduction (consulting local universities, staff, NGOs; organising a seminar);

3. Demonstration project(s) to show the potential of a science shop project and introduce methods of project education (format: international student's project under staff supervision and NGO support);
4. Establishing a science shop (office, infrastructure, funding, selecting advisory board, appointing co-ordinators).

Brno was chosen based on the existing Twin City partnership with Utrecht, to serve as an example for like future co-operation projects.

Despite some good international applied research projects involving student exchanges, the project did not lead to the establishment of a science shop, even though there were sufficient clients for the work. The main reasons for the failure to establish a science shop were: (i) lack of funding, especially after an initial Dutch government subvention, and the resulting inability to pay science shops staff; (ii) changing volunteers on the Dutch side; (iii) language barriers; (iv) the fact that the science shop was to be established as a co-operation of the three Brno universities (a model totally different from Utrecht's faculty-based science shops); (v) lack of strategic alliances with senior managers within the universities, (vi) rigid and mono-disciplinary university systems in Brno.

Romania

The Romania project supervised by the Chemistry Shop Groningen (NL) can be seen as a spin-off from the Brno attempt. One of the key-persons involved in the Brno project had worked in Romania, thus knew the country and its environmental field, and learned the language (an important advantage compared to the Brno-project). Some cities/universities were selected to start science shops on environmental issues, based on existing relations and geographic location (to allow for a regional network in Romanian Moldavia, instead of an isolated single science shop). Budget was obtained from the Dutch Ministry of Foreign Affairs' fund for social transformation. Between 1998 and 2000, four science shops were started, in Bacau, Galati and Iasi (2 universities). All of them were modelled after the Groningen example as a faculty-based science shop, allowing for better Dutch support than in the Brno case. Universities were open to the new idea, which was introduced to the Rectors and Deans up-front to ensure a top-down consent for the bottom-up approach involving interested or recommended staff members. The universities saw science shops as part of their ongoing modernisation and increased international contacts.

The project had sufficient funds to hire two part-time co-ordinators per science shop, for a period of approximately two years (which also differed from the Brno case). These could develop pilot projects to demonstrate a science shop's potential. The successful international student projects from the Brno case were copied, focusing on relevant issues such as water quality and environmental management in industry.

Pilot projects were started on environmental issues of obvious concern to the general public (i.e. drinking water). Simultaneously, demand for research came from a number of social organisations around environmental problems, and from schools (environmental education) and local/regional authorities. Industry was seen as a science shop client in Romania's current economic state as well.

Supply of research capacity could be developed from student research under the responsibility of (at first) the co-ordinators of the science shop, who partly held academic positions already. Large groups of students volunteer. In all cases, the projects have increased the possibility for students to obtain credit points toward their degree for science shop projects as well.

Continued funding for science shops in Romania still is the main issue, though the Romanian science shops can so far be called successful. They set up a link between academia and society, and thereby unlocked domestic problem-solving capacity. They introduced modern teaching methods as problem-based learning, thereby giving students valuable project experience, and emerged in active contacts internationally. The national network yields synergy for the four science shops.

Unlike Brno, this project gathered sufficient critical mass to succeed.

Science shop developments outside Europe

Israel

In Israel, the community-training centre Haim Zippori has since 1997 acted as an incubator to demonstrate the viability of science shops in Israel. Specifically, the Mimshak Program has facilitated three pilot projects by mediating and fundraising. The projects were co-operations of community groups with university researchers, and Mimshak's co-ordinator was influenced by a working visit to the Dutch science shops before starting the programme.

Clients for science shop projects are Israeli NGOs; these are generally strong but have a small budget. For 'supply' in three pilot projects, Mimshak decided to work with scientists. These scientists were paid to compensate for their time, since working for communities does not help their progress in academia (which has to match standard criteria). Including students was postponed to the future, to prevent taking too many steps at one time.

Mimshak intends to structure co-operations with universities in the future, once sufficient funds are obtained from the Israeli government. Ultimately, universities could host a science shop. Currently, fundraising per project can take too long and cause disappointment in the community.
The staff of the Mimshak programme is small (1 person paid by the Zippori centre), but benefits from a broad steering committee and Haim Zippori's contacts. The Mimshak program will continue to further develop and support participatory research (policy planning) mechanisms.

South Africa

In 1995, the Science Advice Unit was started at the University of Cape Town, independent and unaware of developments in Europe. It was organised/hosted as a personal research project of its founder; to supply research he was aided by two post-graduate students. This small staff was only occasionally increased with an administrative helper, and the office was never formally established. Client groups were actively approached, both to raise their awareness of environmental problems and to scout for research subjects/co-operations.

Obtaining funding proved difficult in South Africa at that time as a consequence of re-allocation of funds to former 'black'-universities. The science advice unit was closed in 1998 when its founder left to take up employment at another university, where work on establishing community-based research in South Africa continues.

Other countries

In Australia, two initiatives can be compared: the WISENET science shop that existed as an independent organisation in the late 1980s and the current Shopfront at Sydney's University of Technology (UTS). The stand-alone WISENET shop suffered from a lack of 'supply' and a lack of funding, which ultimately caused it to fail. Shopfront activities are integrated into the existing academic activities (students do projects, linked to course work and supervised by academics); the initiative is supported by senior staff and provides multi-disciplinary opportunities for innovative projects, which have priority at UTS.

Community-Based Research Centres in the USA generally have more participation of clients in their research and policy making. Nevertheless, the majority of them are affiliated to a university. Some examples of how these CBR Centres have started show a relatively large role for public funds and charities, as compared to the European situation.

The recently established Community-University Research Alliances (CURAs) in Canada are based on the Dutch science shop example, after a team from the Canadian Social Sciences and Humanities Federation studied them. Their report led the Social Sciences and Humanities Research Council (SSHRC) of Canada to start the CURA project. This project was set up large-scale, since this was taken to be necessary to acquire enough critical mass for this new methodology to establish itself nation-wide. There was no rationale for starting small-scale, since the system had been tested extensively in The Netherlands, even though the CURA programme was adapted to the Canadian situation. For the SSHRC it was a novelty to start subsidising research infrastructure instead of projects. Also, it was the first time they subsidised non-university-based researchers.

The SSHRC is now funding collaboration in areas of mutual interest to community groups and universities; the first tranche of 22 grants totalled 13.6 million Can$ for the period 2000-2003. Conversations with other government agencies have created interest there as well.

Currently, science shops are also active in South Korea and Malaysia. In both countries, the Dutch science shops serve as an example.

Conclusions and recommendations

There is no single ‘best-way’ to start a science shop; local circumstances play a large role and must inform the way in which a shop is to be established. The model used throughout the case studies offers a structured way to consider and evaluate the potential for a science shop in any new situation. This model describes four important (f)actors or agents who between them determine the success or failure of a science shop, the relations between them defining the characteristics of the shop. All actors are influenced by funders and policy makers, and operate in their social-political, cultural and scientific environments. The following are the key considerations for each actor.

Clients

Since science shops operate in a demand-driven way, ‘clients' are of course necessary. The basic premise is that there is a (maybe latent) demand from society for scientific support. However, sometimes this demand does not match with potential supply. Potential clients may have an unrealistically high or low expectation (or awareness) of science, and civil society can be more or less organised. However, pilot (demonstration) projects can start from individual questions or even from obvious societal/environmental problems.

Clients can be represented in Science Shop Advisory Boards; especially during start-up this can help convince other actors of the need for science shop activities.

Supply

For a science shop it is crucial to have a supply-base of knowledge and research capacity to answer questions from civil groups.

As long as there is no funding to start a separate research institution, it is important to try and integrate science shop activity in existing research and education activities. This usually means a change in research and education topics and methodologies, and not an increase in required funding per se (i.e., in education, students should learn to do research, and academic staff should supervise them in this anyway, no matter whether the subject of research comes from a textbook or from society). Also, science shops are meant to open all existing research and knowledge to society instead of setting up dedicated research institutes that can, of course, never cover all scientific efforts.

From the case studies we learn that supply increases when students are allowed to do science shop projects as part of their curriculum (i.e., for credit points), though in many cases they are interested in volunteering as well. Researchers are quite willing to spend a few hours to apply their expertise to help solve a problem. Also here one should try to integrate social research questions into existing research themes and programs, unless there are (matching) funds available to pay for additional work.

Disciplinary constraints can limit science shop projects. For scientists and students, it should be possible (practically and officially) to work in multidisciplinary settings. Commercialisation forms a threat to the supply of knowledge that can be used for science shop work, since the sector of society served by science shops is per definition the non-profit, non-commercial sector.

Hosts

There are different options for organising a science shop; i.e., by affiliation to a university or an existing NGO, or as an independent NGO. Universities can be good hosts for science shops, since they have some ‘standing’ as being independent, objective providers of knowledge, and they offer a reservoir of scientists and students. Money is usually available at universities if science shop work can be to some extent included in regular activities. The allocation model usually needs to be changed, however. Whether a science shop is located at the central level, or devolved to the faculty or department level, does not affect its chances of success. This choice depends purely on local circumstances.

NGOs can be good hosts when universities do not or cannot co-operate or are not trusted by civil society organisations. They have access to different types of funding agencies whose budget sometimes is large, at other times rather small. An (existing) NGO can also be an incubator to demonstrate science shop projects before disseminating the method to other hosts. It is more difficult for an NGO to work with students or to get accepted by scientists. An NGO form is more independent, however – as long as it obtains finance.

Science Shop Staff

Science shop staff members should have well-developed communication skills and an overview of scientific fields, in addition to experience with or an affinity for working with non-

scientists, community groups and with scientists/researchers. A combination of two people with complementary skills works well.

Often, science shop staff are forced to choose between doing (pilot) projects or spend much effort on fund raising. Having no time to do both at once can cause the initiative to fail. Science shops are vulnerable to staff changes since they are small organisations. Having multiple staff members, written manuals and a good network decreases the risks associated with staff changes.

When the administrative part of science shop co-ordination is not seen as scientific work it is difficult for academic staff to help start a science shop on the executive level. Staff are however able to start science shop projects as a personal research project and later try to establish a science shop office.

It is important to document the work and successes of the science shop, both on social impact and on scientific achievements. In practice, there may be a lack of time to do so, which can cause problems in the long run. PR is generally very important.

Funding/policy making

Larger funding makes the introduction of science shops easier, of course, especially in countries with less economic power. However, also lifting some non-financial barriers by policy makers can be helpful.

If funding is made available to allow the *start-up* of science shops, this can facilitate pilot projects. The results of these projects can be used to convince other actors of the relevance of this type of research and pave the way for its incorporation into regular research and education activities. Seed funding should be for a sufficient length of time, depending on the tasks of co-ordinating science shop staff (i.e., how many other actors still need to be convinced, contacted, solicited etc.). A period of 3 to 5 years seems reasonable. Charity can be a source of funding as well.

When a science shop is organised as an independent NGO structural funding is required. This is dependent on national funding arrangements; in the end it does not matter much whether public money is allocated to a science shop through universities or directly from a government agency. Charity funds are another suitable option here.

Relieving bureaucratic or academic constraints is helpful to new initiatives. When universities host a science shop they should be able (i.e. allowed, or maybe even forced - as was the case in The Netherlands in the early 80s) to use part of their budget for it. Scientists working for a science shop should be rewarded for this work, either by it being in their job description, or financially, or as part of their teaching assignment. This would balance the scales with commercial scientific services to other sectors of the society. It is important to stress that ‘society’ covers the whole range of individuals, non-profits, SMEs through industry. Otherwise, in times of budget cuts, service to society can become defined as service to those who can afford it. It is important to support problem-based learning and multi-disciplinary research to enable valuable knowledge transfer to both students and staff, and society.

Network

The role of an international science shop network in starting science shops can already be classified as important. Information transfer can work well through working visits and/or workshops. Those wanting to start science shops have often visited The Netherlands. A

network can facilitate these exchanges. The network can facilitate a more active coaching and information transfer. This works if the coach can make sufficient time available, and the coaching science shop resembles the new starting science shop. The network can also improve structural co-operation in projects, and shared studies and programs. Obviously, sufficient funding for the co-operation should be available.

The network can facilitate an international (peer-reviewed) science shop journal, which would make it easier for scientists to publish their work and fulfil their academic publishing requirements while doing science shop projects. Articles in scientific magazines can (and have) create(d) a lot of interest in science shops; in a network, cases can be collected and discussed, and articles can be written.

Recommendations

Some policy recommendations can be derived from the work presented in this report. We will focus here on lessons for facilitating the successful start up of new science shops.

From the cases presented here it is clear that it takes dedicated people to start-up a science shop, who are very keen on putting science to work for citizens and the community. Next, science shops work on a small-scale, regional level, which makes them both accessible and flexible. To successfully start such initiatives, mutual co-operation is highly beneficial. Also, the bureaucracy involved for the facilitation of the new initiatives should be the bare minimum.

We see three possible actions to increase the regional dissemination of science shops on the European level:

1. A European network of science shops would ease the creation of new science shops, and would also benefit existing science shops by facilitating constant renewal. For new science shops, an existing network would mean access to information (database, magazine), protocols, case-examples, training and personal support. It is therefore recommendable to support the emerging international (thematic) network of science shops.

2. Project/program funds could be made available for a group of applicants consisting of at least one existing science shop and one new initiative - though it is possible for one or two existing science shops to successfully help start a whole new regional network of science shops elsewhere, as was seen in the Dutch-Romanian case.

3. One could think of a call for research projects of scientists with (support of) community organisations. As indicated above, the bureaucracy involved in applying for such a fund would have to be minimal. Also, finance should be possible up to 100% to make this work in practice, given the very limited availability of matching funds with science shops and many community groups.

Next to the actions above, the influence of moral support from the European Commission to science shops should not be neglected: it is of significant strategic value to strengthen the position of science shops within their host-institutes.

1 Introduction

1.1 Science Shops

A science shop provides independent, participatory research support in response to concerns experienced by civil society. The word ‘provides’ implies that science shops make their services available on an affordable basis, free of financial barriers. Furthermore, science shops seek to create equitable and supportive partnerships with civil society organisations, hence the word ‘participatory’. The word ‘equitable’ in the latter mission statement also implies an iterative interchange of ideas and knowledge between society and the disciplinary research field, leading to a cross-fertilisation of the science. Finally, ‘research support’ is extended ‘in response to’ concerns, thus different from the traditional hegemony of science.

Science shops are an important actor in community based research (CBR). There are many differences in the way science shops are organised and in how they operate, but there are also some important parallels. In practice, contact is established between a civil society organisation and a science shop or CBR centre on a problem in which the civil society organisation is seeking research support. In this collective search for a solution new knowledge is generated, or at least existing knowledge is combined and adapted - again, in a true partnership without ‘science' prevailing in any way. Through their contacts, science shops provide a unique antenna function for society’s current and future demands on science.
There is not one dominant organisational structure defining a science shop. How science shops are organised and how they operate is highly dependent on their context. The above definition of a science shop might also include organisations that do not define themselves as science shops. Organisations that meet the definition of a science shop and do provide civil society with knowledge and skills through research and education on an affordable basis will be taken into account in this review. The term ‘science’ is used in its broadest sense, incorporating social and human sciences, as well as natural, physical, engineering and technical sciences.

The SCIPAS project covered all types of science shops: university-based ones, as well as those situated outside tertiary institutions. Broadly speaking, differences between the European and US/Canadian approaches to community based research can be ascribed to cultural differences and different funding mechanisms for universities and academic research. In the SCIPAS project, most attention was paid to the European approach. Science shops can be divided into 7 clusters, differentiated according to their host institute (university or non-university based), as shown in table 1 (Mulder 2001). Two examples of mixed structures exist.

From table 1, two general tasks of science shops are seen: mediation and research. In fact, this is a gliding scale. After being ‘translated’ into scientific research questions, the research can whither be performed within the science shop, or be ‘outsourced’ to a specific research group. In the latter case, the science shop then mediates the research process, the interaction between the client (civil society organisation) and the researchers, and ensures the usability of the final output. In the US model of CBR, there is a higher degree of participation of the clients in the research, and the research itself can usually be defined more as ‘action research’.
Representatives of the existing clusters, and their way of operating, are described in more detail in the report of SCIPAS workpackage 1 (Gnaiger & Martin, 2001).

Table 1: Theoretical clustering of science shops (Mulder et al, 2001)

HOST:	University based			Mixed (University-based and independent)		Non-university based	
MODEL:	Dutch Model		US Model				
LOCALE:	Central Office	Faculty Office	CBR Centres	CURA (Community-University Research Alliance)	NGO as incubator	NGO (Univ. related)	NGO (Non-univ. related)
COUNTRIES:	Netherlands Denmark Germany Austria UK (Norway) USA/Canada Australia South-Korea Malaysia	Netherlands Denmark Romania South-Africa USA/Canada	USA Denmark (Canada)	Canada	Israel	(Germany) (Austria) USA	Germany Austria USA
MODE:	Mediation *Some:* Internships	Research Mediation	Participatory action research (PAR)	Participatory research	Mediation	Mediation Research *Some:* Participatory	Research *Some:* Participatory

HOST = placement of science shop; MODEL = European/Dutch or US/Canadian concept; LOCALE = organisational unit of science shop; COUNTRIES = countries covered in report; MODE = methodology employed by science shop.

Science Shops in general have three criteria for accepting clients:

1. Clients should have no commercial objectives with their question, and the research results must become public (or 'the question must be for the common good');
2. Clients must be able to use the results of the research to achieve their mission (thus, scattered individual questions may not be accepted; but if necessary clients can also be assisted in applying the results);
3. Clients may not have the (full) financial means to acquire their research by other means (sometimes applicable questions from these clients are accepted as paid research or research at least subsidised by the client).

Table 2. Scheme mapping the modality of the university/society relationship (Mulder 2001)

Target group (social partner)	**Mechanism or modality (within university)**
Individuals - students, graduates, seniors - pupils - general public	Formal and non-formal courses (including life-long learning) Public courses; lectures; science week; Open House; high-school desk; popular magazines PR department
Community Groups NGOs Non-profit sector Local authorities (SMEs - non-profit questions)	Science shop
Small and Medium Enterprises (SMEs) Regional authorities	Technology Transfer Bureau; Business Service Centre
National authorities Industry	National Science Foundations Contracts Paid chairs

For the university-based science shops, it is good to bear in mind that they are only *one* of the university's contact points with society; all the above target groups have their own dynamics and require dedicated, tailor made services (cf. table 2). However, insofar as science shops service sectors of society that normally have little access to science their position is a special one within the university.

1.2 The SCIPAS-project

The SCIPAS project ('Study and Conference on Improving Public Access to Science through science shops') led to seven reports and a scientific conference. The executive consortium consisted of institutes from The Netherlands, Germany, Austria, Northern Ireland, Denmark, Israel, Romania, South Africa and the USA. The seven studies that were done in preparation to the conference are:

1. Compiling an inventory of different ways to organise and operate a science shop in different countries, including the participating countries. Identify best practices, and internal and external pros and cons of various operational options. Investigate the impact on the social and environmental conditions of citizen groups.

2. Compile a report on success and failure in starting new science shops and lessons to be learned to facilitate and support the creation of new science shops.

3. Make an inventory of needs and resources for training programs for science shop staff members. Identify mechanisms for matching science shop staff with training programs.

4. Describe the options for setting up an international science shop magazine or other means (e.g., an Internet archive) for publishing science shop research results and policy issues internationally.

5. Set up a free, publicly available Internet database of existing science shops and facilitate Internet contacts among science shops. Make an inventory of options for using automated translation facilities and interesting links.

6. Investigate the impact and develop strategies for how science shops can contribute, and are contributing, to the development of university education and research, i.e., their impact on curricula and research agendas.

7. Investigate the potential benefits of, and the conditions for, transnational co-operation among science shops, including transnational research collaborations.

The conference 'Living Knowledge', was held in Leuven, Belgium, from 25-27 January 2001. It was attended by 106 people from 19 different countries over 4 continents. This conference was the starting point for the European network of science shops, provisionally entitled 'Living Knowledge'. This network includes the four dozen science shops currently existing within the European Union and it will hopefully facilitate the creation of new science shops throughout Europe (including less-favoured regions). The network also includes science shop-like institutions and networks outside of Europe. Ultimately, the benefits to science and society interactions will be:

1. Increased visibility and accessibility: Science shops become more publicly visible, thus more accessible to potential client groups. It opens avenues for support from universities and citizens, as well as policy makers.

2. Improved documentation and evaluation: New participants (e.g., newly established science shops) get support more easily, by standardisation of documents, protocols, etc. without neglecting their regional context.
3. Dissemination of results:
   a. Research results become more widely disseminated (including internationally). Successful research models can be replicated and further developed.
   b. Research themes can be distinguished; information on emerging subjects can be compiled and communicated to policy makers and (other) research institutes.
4. Collaboration: Collaboration yields synergy and helps utilise previous experience. More comprehensive studies can be done. Citizen group driven studies on transnational issues become more practicable. Science shop policy and strategies will also benefit from co-operation.
5. Quality control: A network enables standardisation in documenting, evaluating, archiving and retrieving science shop research results.

This report, along with the reports of the other six SCIPAS workpackages, are milestones in achieving such a European network.

2 Delineation

France already knew Law Shops as far back as 1873. These Boutiques de Droit were set up in neighbourhood centres and settlement houses, and were meant to add to the public good and support citizens in participating in the community. They offered free information on social and juridical themes (Stewart and Kahn 1985). The current Science Shops differ from this in as much as they perform research as well, and are not focused on giving information to individuals[1]. Still, as far as can be established, the French 'Boutique' was the earliest form of science shop, beating the earliest Dutch example, the Social Technical Society's 'Advisory Bureau' at the Technical University in Delft by 35 years (Groenewegen en Swuste 1983).

The contemporary history of science shops in Europe was initiated by critical university staff and students in the Netherlands in the 1970s, ideologically linked to the movement of 1968; their establishment coincided with the emergence of project-based education in universities, and was fed by an emerging environmental awareness in society. The approach had wide appeal, and within 10 years science shops had been established at all Dutch universities as a bureau of the institution, serving many scientific disciplines. Although the science shops professionalised further in the 1980s, they managed to maintain their original mission even in the changing 1990s – albeit with some reorganisations.

Publications by Ades in Nature (1979), and Dickson in Science (1984) triggered much attention abroad, with work by Nelkin and Rip (1979), Leydesdorff (1980), and Zaal and Leydesdorff (1987) detailing the benefits; as a result, the method was subsequently imported to and sometimes adapted by many other countries.

The first wave of 'imports' from the Dutch science shops into other countries dates from the early 1980s, in Belgium, Denmark, Northern Ireland, France, Germany and Austria (the latter two in a modified way). In the mid/late 1990s, the science shop method was a source of inspiration for projects in England, Israel, South Korea, Australia (renewed) and Canada. Some developments in England in the 1980s occurred separately from the development of the Dutch science shops. In South Africa, a Science Advice Unit was started independently and unawares of the Dutch example in 1995.

In the mid-1990s, some Dutch science shops even started to 'export' their method actively, to the Czech Republic and Romania.

In the USA, community-based research developed separately since the 1970s. A publication by Sclove in the Chronicle of Higher Education in 1995 linked the European developments to those of the Community Based Research Centres in the United States (Sclove 1995, Holden 1996). Also, the Canadian Social Sciences and Humanities Research Council started to support science shops in the late 1990s, based on the Dutch example (Rousch, 1998). Over the last few years, contacts between North-American and Dutch-model science shops have intensified.

In this report we will deal with the question why some science shop initiatives succeed while others fail. Are there any general conclusions we can draw from this that might benefit new attempts?

[1] Boutiques de Droit in their original form, and as Bureau's or Clinics for Legal Aid in many countries today, may in fact be clients of the current Science Shops when seeking support on technical problems outside the legal field. Legal Aid Clinics differ from the current "Law Shops" (which exist as de-centralised science shops in The Netherlands). The latter do not focus on individual problems or legal aid, but conduct research on legal themes that comprise issues for civil organisations - or general questions from Bureaus for Legal Aid.

We start with a description of the method and theory used in this analysis (Chapter 3). The results of our analyses are presented geographically, beginning with the history of the Dutch Science Shops, followed by developments in the other European Union countries[2]. The next part of the report focuses on the developments in Central and Eastern European Countries and describes the active Dutch export of the science shop method and model to the Czech Republic and Romania. This co-operative venture could be important in the future European integration. Finally, an overview of some developments on other continents will be given.

In the final conclusions we will discuss the success and failure features, and give a checklist to bear in mind when starting a new science shop, or supporting such start up.

[2] Due to lack of information, initiatives in the non-EU countries Switzerland and Norway are not discussed.

3 Methods

The existing literature on the start of science shops was surveyed. Literature was retrieved from the archives of the Dutch National Secretariat of Science Shops, which holds many international publications, as well as from the personal archives of SCIPAS-consortium members and others. An online search was done on the word 'science shop' and its literal translations in Dutch, German and French in the PiCarta database. This database holds all books in Dutch University libraries and also all titles - from 1992 - of all articles in all journals that are available in these libraries. Three person-to-person interviews were held with actors involved in the French science shop movement of the 80s, and two in Brno with those involved in the Czech science shop experiment (mid-90s). A number of persons shared their information with us by phone, fax, e-mail and in person. The authors have personally been involved in the Dutch, South-African, Israeli and Romanian developments.

In analysing the cases, we adapt a basic model described by Stewart and Kahn in 1985 and graphically illustrated in Figure 1. The model sets out the success or failure of a science shop in terms of the involvement of four essential agents or actors: Clients (the demand for research support)[3], Scientists (a supply or source of research support), Institutions (a host or supportive structure), Science Shop staff (executive level, both individual and collective). If the support of any of these is zero, the initiative is bound to fail.

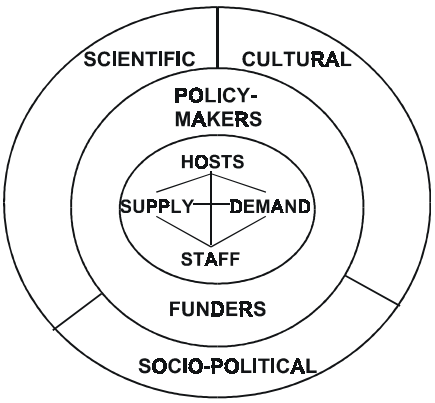

Figure 1. Science Shop in its surroundings.

To Stewart and Kahn's model, we add the role of funders and policymakers. All agents will have their own networks (or lack thereof), which can influence their behaviour, and so the 'network' factor can be thought of as the matrix embedding the above diagram. Funders and policymakers may influence the development of science shops either through regulation or subvention, directed at any of the agents involved.

Clearly, the four agents listed above exist within specific historic socio-political, cultural and scientific environments or contexts (cf. Figure 1); we therefore also factor these considerations into the model. Five cases will be presented in detail: France (1980s), the Czech Republic, South Africa (mid-1990s), and Israel and Romania (late 1990s). In describing these cases, we give an introductory history and we outline the specific socio-political, cultural, scientific and environmental contexts prevailing during the respective periods. Developments in other countries will be discussed briefly. We start off with an introduction of the Dutch case (1974 - to date), in which we also discuss prospects for their success in the long term.

[3] Since 'clients' also have a lot to offer (local knowledge, new research themes), the terms 'demand' and 'supply' are in fact too absolute. In practice, there is a two-way flow of knowledge.

4 Science Shop initiatives in the European Union

4.1 Netherlands

4.1.1 History

The history of Dutch science shops is well described in literature, be it mostly in Dutch. This chapter is largely based on Lürsen *et al*. (1999 and 2000), which in turn are based on much of the original literature[4].

The Dutch science shops commenced in the early 1970s, as an initiative by critical students and staff. Their establishment was concomitant with an increase in environmental awareness and concern (leading to the formation of environmental NGOs) and the start of inter-disciplinary research at university. Research groups in Science and Society Studies, and in Environmental Science were started simultaneously. Even though the Science and Society Studies groups focused more on theory, they were open to science shop work. Clients and 'providers' (i.e., a group of critical staff and students) were thus present; science shops were started by voluntary co-ordinators. All it took to start was an office and a phone, and even this could be simplified. The Amsterdam Science Shop started as a box into with the received questions, which would be taken into the office of any staff member for processing (Farkas 1999). The Groningen History Shop started in a corner of the department's bicycle shed, closed with chipboard (Spits 1999).

Science shops benefited from the financial autonomy of Dutch universities, and from a clause in the Higher Education Act which directs universities to 'pay attention to the advancement of a sense of social responsibility' (Turney 1982). The 1968 student protests had led to the 1972 Law for University Administration Reform, bringing democracy into universities, which has been of crucial importance (Spits 1999). Elected University Councils, with staff (scientific and non-scientific) and students represented, started functioning as university parliaments.

Together, active staff and students convinced the universities ('hosts') as well as the Minister for Science and Education of the value of science shops. By way of illustration: in Groningen, the university council member and biologist Reddingius presented a paper to the council on science shops in 1975. In 1976 a committee was established – reporting to the Rector – to investigate the viability of a science shop at Groningen University. As a result, in 1979 the first four science shops were started at the Departments of Pharmacy, Chemistry, Education and Economics. The university board and the departments jointly fund these, reflecting a shared interest in science shops as well as a shared responsibility for them (Spits 1999).

A memorandum from the Minister for Education and Sciences to Parliament in 1983 stated that each University should provide 2 to 5 full-time job equivalents to a science shop, to be paid from the university's own budget (Sliedrecht and Van Der Avoird 2001: 10). For the Science Shop in Tilburg, as an example, this led to 4.5 full-time job equivalent posts being financed. The science shop uses part of this money to hire paid researchers (e.g., by co-financing PhD research projects). This was a large extension of the possibilities they had

[4] In Dutch: Hobbelink and Depma 1996, Hendriks-Lemmen 1996, Pennings and Weerdenburg 1989 and 1991, Rinsema 1997, Spits 1999.
In English: Ades 1979, Dickson 1984, Farkas 1999, Holden 1998, Leydesdorff 1980, Raloff 1998, Rousch 1996, Turney 1982, Zaal and Leydesdorff 1987.

from 1980 (voluntary student organisation) through 1982 (first paid staff granted based on the experiences in the first two years).

By the late 1970s and early 1980s, science shops had established themselves as departments at all Dutch universities[5], all with some paid staff. One science shop in the province of Zeeland was initially not linked to a university, but in due course its tasks were transferred to the Rotterdam University science shop. Science shops by then covered all scientific disciplines. They were backed by Advisory Boards, which at that time had many non-university members (such as labour unions, environmental NGOs, etc.). For the Amsterdam Science Shop its contacts with the unions were especially important. From the late 1980s, societal representatives slowly disappeared from advisory boards: clients were satisfied, in general, and also became more aware of time constraints in planning their own work.

In the late 1980s, early 1990s, an increased professionalisation was visible. Many clients professionalised themselves, leading to more complex questions (i.e., regarding sustainable development instead of the dangers of an individual toxic waste dump). Many clients started doing in-house research on simpler questions. However, even for those questions they still turn to science shops regularly, because of the value of 'independent' research, and also because of lack of time/capacity in the own organisation. New clients and new fields of research kept emerging as well; the group of 'just organised, non-expert' clients still exists.

Science Shops became a big success. With over 30 offices, they now cover the country geographically and topically[6]. For an overview of the work of science shops, their organisation and impact on society we refer to the report on Workpackage 1 of the SCIPAS project, which also gives an overview of projects done by the Dutch science shops recently (Gnaiger *et al.* 2001). The start of the 2000s shows a renewed enthusiasm among the Dutch science shops, partly based on the foreign interest in, and recognition of their achievements.

4.1.2 Analysis

In this study, it is important to pay some attention to the long-term success of the Dutch science shops. In the 1990s, they were confronted with declining university budgets and more stringently defined curricula for students[7]. A 'supply' problem occurred. Some science shops started to offer students a little payment if they finished in time and prepared presentable reports (i.e., if they were assessed as good by the client).

Universities were under pressure to diversify their income streams and attempted to raise more private funds for research. As a result, closer relations with industry emerged and the general atmosphere at universities became more 'commercial'. In 1998, democracy was abolished at universities by the new Law on University Administration Modernisation (the 'MUB', which aimed at increasing the efficiency of University Administration). It replaced the 1972 Law on University Administration Reform, which had just brought democracy. No longer did students and staff have any formal say in university policy other than accepting or rejecting the total annual budget every year. Also, the 'service to society' paragraph was excised from the Higher Education Act, thus reducing the mission of universities to research and education, while dropping the third leg of higher education: community outreach.

[5] Except at the single private university in the country, business-university "Nijenrode".
[6] See Website of the Dutch National Science Shop Forum: http://www.wetenschapswinkels.nl/
[7] Curricula had first been tightened in 1982; thereafter government scholarship-rules became even stricter, students having to finish their studies faster while receiving less money, basically forcing them have a side job which reduced their time available for studies even more.

The changing scientific and socio-political climate led to attempts to close down some of the – by definition, non-commercial – science shops. We discuss all these attempts below. Please note that approximately 30 science shops are still successfully in operation, despite these few closures. They are still supported by their universities, for reasons of social responsibility, PR, problem-based learning et cetera. Some science shops took up new tasks as well, by introducing regular course modules in their field, organising internships, doing paid research projects or by setting up a mediation service for Small and Medium Enterprises if its university did not have such service yet.

An attempt to close down the Chemistry Shop in Groningen, in 1990, failed. The Chemistry Department had a large budget deficit, requiring a reorganisation. The most important proposals of the Board were to close down both the Chemistry Shop and the Department for Chemistry and Society (because they were seen as being outside the scope of the department's core business). Massive protest from clients saved the Chemistry Shop[8], but the Chemistry and Society department could not be saved.

The (central) science shop at Amsterdam University was first to be closed. Wachelder (1996) describes it as a slow death. Confronted with a changing academic situation (commercialisation, tighter curricula) and the threats of budget cuts in the early 1990s, the science shop decided to become a professional knowledge-broker, living from the commission that would be paid for its services. It would operate some pilot projects on internal funds to obtain large subsidised projects thereafter. The science shop would concentrate on three social issues: minorities, urban unemployment, and mobility in the Amsterdam region, and would mediate student-internships to companies and institutes. Reorganisation of the university's central activities brought the shop into one office with the technology transfer bureau, international liaison office and the public relations office. In this department, the shop initiated the Bureau for Stimulation of Research for Society with a budget that was immense by science shop standards. However, the brokering did not put the shop at the heart of the university's mission of research and education, and its focus areas started to work against it: in the region there was no fast changing demand and supply of knowledge on the themes, meaning – effectively – that there was no 'market' for the shop's services[9]. Moreover, many members of staff left for various reasons, among them the shop's founder Bas de Boer[10]. Sometime, probably late in 1995, the last remaining staff member was unable to resist the university's administration decision to close down the Bureau. In any event, the term 'science shop' had disappeared many years before, so its demise was not noticed.

In the mid-1990s, the science shop at Leiden University could not be saved, despite the same type of protests by clients as in the Groningen case (Van Den Sigtenhorst 1996). The official arguments were that clients could now provide for themselves, and that the research budget for socially relevant research would remain. Only the intermediate, the science shop, would be closed. This was despite the enormous praise that the science shop had received from the Board of the university only one year before, on the shop's 15th anniversary (Wachelder 1996).

[8] Clients such as environmental NGOs, unions, etc. all sent protest letters. The provincial environmental federations asked all local authorities in the northern region to do the same (which almost all did). After a call on national radio many individuals sent postcards and petitions with a lot of signatures. Last but not least, students also delivered a petition to the Board.

[9] Being open to new themes would prevent this; also being involved in the research process as more than just a broker could have been helpful.

[10] D.J. Coehoorn, co-ordinator of science shop and transfer bureau at the Free University Amsterdam, and closely involved with the science shop of the University of Amsterdam in the past, called De Boer's departure "decisive" (*personal communication* 2000).

Next to its central science shop, the Free University of Amsterdam also had science shops for Biology, Chemistry, Economics, and Health. Because of reorganisations, changes in the educational system, personnel developments, etc., these science shops were all closed down between 1994 and 1997. A new science shop for Environmental Issues started in 1995, in an attempt to replace the biology and chemistry shops, and maintain their expertise. It too was closed in 1998. All the tasks of the specialised science shops were more or less taken over by the central Science Shop office. This office was merged with the PR department and the technology transfer bureau of the Free University (in rationalisations similar to those of Amsterdam University), but managed to maintain its name and internal and external image.

In 2000, an attempt was made to close down the science shop at Delft University[11] which had been transferred – against its will – into the Business Service Centre (BSC) of the university, during a reorganisation of all university's central staff departments in the late 1990s. When raising the possible closure, the university Board mentioned two reasons: the university was accessible at all levels of society already (although the continuation of the BSC for paying clients was deemed necessary), and the need for budget reductions (despite the very modest budget of the science shop). Delft University wants to focus on being a Top-5 university.
The science shop was already 75% under-staffed, after two persons changed jobs in early 2000 subsequent to chief co-ordinator Busquet's death in March 2000. In March 2001, the last remaining staff member called it quits after a one-year useless struggle to convince the BSC's director to allow the vacancies to be filled. Neither clients, students, nor staff voiced very loud protests. Since the passing of the MUB, there no longer exists a University Parliament in which these issues could be negotiated with the university Board. Mid 2001, only the Work Council remains as a last hope.

Many other science shops in The Netherlands have been subject to reorganisations in one way or the other, but managed to uphold their original objectives (Farkas 1999; Wachelder 1996), despite struggles for survival.

In addition, science shops needed to adapt pragmatically to the circumstances prevailing in higher education in the late 1990s, with many broadening the scope of their activities, as illustrated by the following examples:

- at Utrecht and Enschede science shops provided support for small and medium enterprises in the absence of such support from other parts of the universities;
- when there was a need for Science and Society teaching programmes, science shops developed such courses (Groningen 1990s);
- internship co-ordination offices were established where other parts of the university were not providing this service (Groningen Economics Shop, 1998; Free University Amsterdam, late 1990s);
- the Deans of the seven Faculties with a science shop at Utrecht University signed a co-operation agreement to support the science shops and strengthen their mutual co-operation and joint central office.

As another aspect of changing circumstances, most science shops started levying small fees, while many became more active in trying to obtain project funds. The Chemistry Shop Amsterdam reorganised itself into a research group doing mostly paid research, on behalf of any client, including multinationals – provided the research theme and objectives fall into the shop's original criteria, e.g., improving labour conditions or mitigating environmental

[11] Personal communications with Arnold Bergstra, Science Shop Delft, 2000-2001 and interview with N. de Voogd, Chairman of the University Board in *Delta*, 23 November 2000.

problems. Arguably, all the original aims and criteria are still upheld by the Dutch science shops on the whole, clients without the ability to pay still receiving support.
Most Dutch universities still support their science shops and view them as a valuable asset to both university and society. The Universities of Eindhoven, Groningen, Utrecht and Rotterdam's Faculty of Sociology and the University of Amsterdam's Faculty of Chemistry still operate successful de-centralised science shops, and the Universities of Maastricht, Nijmegen, Tilburg, Twente, Wageningen and the Free University Amsterdam still have successful centralised science shops.

4.1.3 Discussion

During the start-up period of the Dutch science shops in the 1970s, all circumstances seem to have been favourable. There was a demand from society by well-organised yet unprofessional NGOs that were concerned with many issues, and especially environmental ones. Next, there were powerful labour unions. The combination of critical students and staff could supply scientific research, project-education was commencing simultaneously, and the public universities were democratising, and open to more interaction with society. Students had the time to voluntarily help run a science shop. Supply, demand, hosts and staffing of the science shop was available. The only science shop without 'supply' closed soon (Zeeland; not associated with a University). The Ministry's directive on budgeting working hours from the central staff budget to science shops played a critical role in the successful establishment of the Dutch science shops.

Since then, science shops clients have themselves become more professional organisations and have developed more in-house capacity, also for research. Overall, this has led to more complex questions being posed to science shops. Some professionalised groups also profit from the *independent* status of the science shops, in that they can claim to have objectively determined facts speak in their favour, for example, in lobbying processes. However, newly-established and loosely organised citizens groups are still important clients.

The Netherlands is a relatively small country with a good infrastructure, which enabled swift dissemination of the science shop idea; a national network was formed instantly. The network continues to function well: every two months representatives from all science shops meet; once a year there is a national meeting for all involved, and there is a shared e-mail/website facility.
All this does not mean, however, that the people involved did not have to struggle to achieve their ideals; it still took many years to get the science shops formally established. At times, it took considerable effort to prevent their closure. Current threats are the ongoing commercialisation of science and universities, and the smaller amount of time which students have to finish their studies. The reduced democracy at universities has also been unfavourable.

4.2 France

The contemporary science shops in France arose in the early 1980s, with as many as 16 shops (Boutiques de Science) established between 1981 and 1986. At present only two remnants remain, integrated into the Scientific Cultural Centres in Strasbourg and Marseille. How did this initiative come about and what led to the demise of the science shops, so soon after their start? Stewart and Kahn (1985) and Stewart (1988) give some insight into this, the discussion below drawing heavily on their work unless noted otherwise.

4.2.1 History

In May 1981, some representatives of the French radical science movement visited a conference in Louvain-la-Neuve, Belgium, in which representatives of the Dutch science shops made presentations (for a report, see Cahiers Galilée 1983). To the French delegates, the Dutch science shop method and model appeared as a catalyst to fulfil abstract, ideological ambitions they had held since the late 1970s. As a coincidence, on returning to France they learned that Francois Mitterand had just won the general elections, indicating a shift to left-wing politics after 20 years of conservative rule. This re-opened political space for proposing changes in science and stimulated discussions among scientists, trade unions, and business leaders on how to bring science into a closer, better relation with society (Benarroche[12]).

During the following months more information was exchanged with the Dutch science shops, and project proposals were circulated among the Regional Assizes for Research and Technology – regional public meetings organised by the new Minister for Science and Technology, Mr. Jean-Pierre Chevenement. In January 1982, seven institutes started doing science shop-projects[13] (still without an office or organisational structure). Science shops were discussed at the plenary session of the conference on the 'New Missions of University' in Lyon. In spring of that year there were many contacts with interested ministries, e.g., the Director of Research of the Ministry of National Education appointed a special liaison officer for science shops in his department. The first national meeting of science shops was held in Paris.

Petitjean[14] criticises the national discussion under Chevenement and its final report compiled by the commission secretary Michel Callon as being dominated by the scientific mainstream – intent on preserving existing science budgets and institutions. A subordinate commission, chaired by Jean-Marc Levy-LeBlond, issued a report on advancing social responsibility in science, including the establishment of science shops. Intriguingly, despite such suggestions, Minister Chevenement called on scientists to fight the 'anti-science movements' such as the environmental and anti-nuclear movement.

In June 1982, an inter-departmental task force was formed to implement science shops in France under the wings of the Interdepartmental Mission for Information on Science and Technology (MIDIST)[15]. The National Federation of Science Shops FNBSA was established in October 1982, while parliament in 1982 and 1983 passed two bills making public dissemination of scientific results part of the responsibility of a scientist.

In June 1983, an agreement was finally signed allocating funds to the science shops. The largest share was contributed by the Ministry of Culture[16], and the funds were allocated to the Boutiques' National Federation. With this budget, six first generation science shops hired paid staff[17]. Scientists were allowed to work on science shops projects within their daily work at the CNRS and other public research institutes, and universities hosted an office. The Ministry of Culture provided their funds because of the 'cultural development' the science

[12] Benarroche, M. (Founder Boutique de Science/Director Centre de Culture Scientifique, Technique et Industrielle Provence Mediterranee), interview by R.E. Sclove, Marseille, October 1999
[13] Most prominent in Lyon and Paris-Jussieu, but also in Seine St. Denis, Clermont, Lille, Grenoble and Marseille.
[14] Bordeaux, Nancy, Nice, Corsica.
[15] This task force consisted of representatives from: The Ministry of National Education, The Ministry of Research and Technology, The Ministry of Culture, the National Centres for Scientific Research (CNRS), the National Centre for Health and Medical Research (INSERM), the National Centre for Agricultural Research (INRA) and the French Agency for Innovation (ANVAR).
[16] The Ministry of Culture donated 580.000 FF (approx. 113.000 Euro at present value). Other participations: MIDIST 239.000 FF (46.000 Euro), Ministry of the Environment 160.000 FF (31.000 Euro), Office for Regional Development DATAR 100.000 FF (19.500 Euro), Ministry for National Education 50.000 FF (10.000 Euro).
[17] Grenoble, Lyon, Marseille, Paris-Jussieu, Seine St. Denis, Strasbourg.

shops were expected to deliver. For the science shops, this meant they were sometimes linked (or perceived to be linked) to the equally new Science Cultural Centres (Petitjean[18]).

In February 1984, three new science shops emerged[19]. The Ministry of Culture supplied some more funds, though the total funding for the growing number of shops was now only 60% of their budget in the first year[20]. Later that year, three further boutiques emerged[21], yielding a total of twelve. In later years, four more science shops were reported (Petitjean).

In 1985, the science shops agreed a common goal of improving the interaction between the public and science/technology; conceptually, mediation and provision of research services and support were meant to achieve this goal. In the years of their existence, the French science shops handled about 400 requests per year (data on 10 shops), about half coming from individuals, a quarter from associations (NGOs), and the remainder from regional authorities and agencies, industry (small businesses) and commerce. The requests covered a broad area of subjects and scientific disciplines. The number and the duration of the research projects, as well as the type of research performed are very similar to those of the current Dutch science shops, even though there were considerable differences amongst the French science shops (again, as is the case today in the Dutch network).

Later meetings in 1985 with a range of governmental agencies did not result in any decision concerning additional funding, despite the efforts of FNBSA president John Stewart who devoted much of his time to fundraising. The limited funds acquired by the FNBSA in their second year now had to be shared by 12 science shops instead of 6. The resulting resource crunch directly led to the decline of the science shop movement and the disappearance or marginalisation of the Boutiques, some of which continued as (or in) Science and Technology Cultural Centres.

4.2.2 Analysis

Stewart and Kahn's main analysis of the French Boutique de Sciences initiative is that clients, scientists and institutions supported the science shops on a basic level - level '1', on a scale from 0 (no support or counteractive) to 2 (dynamic support). The attitude of these first three agents is discussed in Stewart and Kahn (1985), Stewart (1988), and in the interviews with Benarroche, Petitjean and Stewart[22] (1999).

1. Clients

a. Not all potential clients came to the Science Shops; many were supposedly unaware of the scientific component in their (social or personal) problem. Nevertheless, the number of approaches to the science shops was almost satisfactory.
b. Most clients to the science shop had no interest in the science shop as such, but were only interested in obtaining an answer to help solve their own problem. There was no broader or strategic participation of clients, e.g., in advisory boards. The fact that about 50% of the questions to science shops came from individuals, and not from organisations, added to this lack of support (or support capacity). Science shops were not supported by large social movements organising around specific issues (such as environmental pollution), in contrast, for example, with the science shop-rich Netherlands.

[18] Petitjean, P. (First Director Boutique de Science Strasbourg), interview by R.E. Sclove, Strasbourg October 1999
[19] Lille, Orsay, Rennes.
[20] The Ministry of Culture supplied another 380.000 FF (74.000 Euro) in total. MIDIST was willing to supply 35.000 FF (6800 Euro) for each of the nine shops.
[21] Lorraine, Poitiers, Toulouse.
[22] Stewart, J. (Founder Boutique de Science, Paris-Jussieu, and first Chairman French National Federation of Science Shops), interview by R.E. Sclove, Paris, October 1999

c. Most clients of the science shop expected a tailor-made scientific answer to their questions on short notice. They were not aware of the limitations of science; this is partly claimed to be a result of the overwhelming focus on scientific *successes* in the media and science museums. Clients were disappointed when they could not be helped in the way they had expected.
d. According to Petitjean, the French social movements do not traditionally attempt to develop their own autonomous capacity to solve social problems. Instead, they address themselves to the state, expecting the state to solve the problems. This made the acquisition of research questions for science shops harder (especially those aiming at results that were to be used by the social groups). Also, it means that when Mitterand's socialist government weakened, less attention was given to the issues raised by the social movements – thus there was less state attention on something like science shops as a means of addressing social issues.

2. Scientists

a. In general, scientists were willing to answer questions if this fell within their specific expertise and the time involved was no more than a few (i.e., four) hours. They did appreciate this appeal to their expertise for a real life problem.
b. Generally, scientist felt little moral obligation towards society, even with those with a leftist background: science itself was already advancing society and its economy.
c. The French science shops never worked with student-researchers.
d. According to Petitjean, there is an unusually high degree of centralised state direction of science in France, making it more difficult for local initiatives to succeed.
e. There was a relatively large group involved in the science shop; e.g., in Paris-Jussieu there was a collective of 20-30 persons from various universities and institutions, 7 to 8 of which were present in any given weekly meeting.

3. Institutions

a. The attitude of institutions is described as being 'intrinsically unclear'. Science shops were not forbidden, but neither were they actively supported.
b. Scientists were allowed to work on science shop projects in their daily work at universities or institutes, but the associated administrative, organisational and mediating tasks were not seen as scientific work and therefore had to be done in the scientist's spare time – or, given the means, by additional hired staff.
c. The funding for the science shops came from various sources and was not assured for a long time (after the first year funds were already cut to 60%). Since the funds were funnelled through the national federation, competition for funds and the ensuing tensions undermined the purpose of the association: drawing the science shops closer to each other and co-ordinating their efforts. Stewart did originally propose a funding scheme that would allow science shops a gradual transition to local and regional funds, but it never got that far.

4. Science Shop Staff

Given the above assessment, the success or failure depended on the actions taken by the fourth category of agents: the science shop staff (and the group of critical scientists supporting them). Successes might create a positive feedback loop, which would raise the other agents to a 'level 2' (dynamic support), creating further growth of the science shops capacity, and so on.

Science shop staff needed to translate the problems formulated by their clients into a scientific question (which was a rewarding experience to them, but also time-consuming). They would also have needed to network with (potential) client groups or generate a lot of

publicity on successful projects, in order to make people and NGOs see the connection between their problems and the scientific capacity to help solve these. Science shop staff also needed to convince scientists of the scientific interest in doing science shop research. At the same time, institutional support would have to be raised and budgets assured.

Two strategies for survival were envisaged. On the one hand, Paris-Jussieu, Seine St. Denis and Strasbourg focused on projects[23]; they reasoned that with successful projects the other agents could be convinced of the value of science shop work. On the other hand, Marseille and Grenoble (to a lesser extent) focused on administrative negotiations to create the right conditions for successful projects. The National Federation also chose the latter strategy.

In the end, all of these tasks proved too much for the initial group of scientists that had started the Boutiques de Science, and they failed to establish the positive feedback loop they needed.

The budget cuts were not a consequence of budgetary problems, since the financing of the Science and Technology Cultural Centres continued on a higher level ('infinitely higher' in Stewart's words). It was also not caused by a policy change since the budget cuts preceded the loss of the general elections by the socialist government. It has been suggested that because of capital flight from the country at the time, government was more in favour of presenting science and technology success-stories through the Science and Technology Cultural Centres, rather than the science problematique. Science shops were not part of mainstream science, despite the lack of any opposition to them from, e.g., industry. Stewart and Petitjean both feel that the Science Cultural Centres (and science museums) popularise an unrealistic, uncritical view of science, which adds to false expectations of science as a magical and instant solution to everyday problems by potential science shop clients.

Benarroche started the Science and Technology Cultural Centre Province Mediterranee in Marseille in 1986, seeking to make the science shop part of 'something larger' to increase its chances for survival. There no longer is an office labelled 'science shop', and although the centre still receives about 60 small information requests per year, with perhaps 2-3 requiring an original research project of some sort, the science shop task is marginal within the centre. The Strasbourg science shop also still exists within the STCC frame, but on the whole the relations between the Centres de Culture Scientifique, Technique et Industrielle and the Boutiques de Science seem ambivalent.

4.2.3 Discussion

There are many reasons why the French science shops have disappeared, and it is difficult to prioritise them. Certainly, the following aspects have been important:

1. The Boutiques de Science never worked with student researchers, and were unaware of the way students could act as volunteers or receive course credits or payment for their work. Including students may have increased the shops' capacity and their integration into their university base. It might also have made contacts with clients easier - i.e., less 'elitist' than having only professors doing the research (Benarroche). On the other hand, the availability of graduated researchers at the CNRS was a clear benefit.

2. The science shops accepted many questions from individuals. This decreased the social impact that their research could have had. In general, it scatters the shop's profile and

23 Lyon focused on projects that also increased the public understanding of science. As a result, they could only handle 12 dossiers. The more pragmatic approach of Marseille answered more dossiers, but in a one-way Q+A. Marseille was more in line with the existing expertise and practice at University and had better chances for survival.

leads to a lot of work just to raise the well-being of some individuals. However, in the developing stage of the science shop initiative in France, it is hard to imagine how this could have been avoided. Social organisations expected instant results, and were focused on the central government to come up with the necessary solutions to their issues. Sample projects thus had to depend partly on individual questions. Only after some good sample projects, more questions from NGOs could have been solicited.

3. The fact that the administrative and other support activities of science shop work were not seen as part of the regular scientific load (or regular duty of a research institute or university) considerably increased the workload of science shop staff. This attitude contrasts with the acceptance that a scientist who is, e.g., head of a department also has significant non-scientific tasks that are simply 'part of the job'.

4. In retrospect, Stewart (1988) notices that the Boutiques did not stress their *scientific* relevance in their activity reports, which is evident, however, on inspection of relevant dossiers for each science shop. The science shop staff did not have time to adequately report on this.

5. In order for the initiative to have succeeded more sustained financial support was needed. The resource crunch led to competition instead of collaboration. Also, the bureaucracy required to secure funds for the network was too considerable[24]. Changing the amount, duration and way of funding may well have enabled science shop staff to break through the vicious circle the French shops were caught in.

6. The French shops could probably have benefited from all the trial-and-error learning of the Dutch science shops. There had been ad-hoc contacts with the Dutch, but no structural exchange of ideas could take place. Especially, information on how to include students in the science shop's work, various options for becoming incorporated into host institutes, and on the Dutch experience in working with social organisations could have been valuable to the French at that moment. On the national level, although an exchange of ideas and strategic discussions were taking place, these failed to reach the level of those in The Netherlands today (Benarroche).

4.3 Germany and Austria

4.3.1 History

The early history of science shops in Germany is well documented in Block-Künzler and Graf (1993). Additional information was obtained from the archives of the Wissenschaftsladen Bonn.

The academic world in Germany was confronted with the science shops through two articles in the critical science journal 'Wechselwirkung' in 1979-1980. Interested scientists formed a discussion forum and information exchange on this theme, resulting in the establishment of an 'Arbeitsgemeinschaft der Wissenschaftsladen' (AWILA), later to be turned into a foundation. The first German science shop started at Essen University based on the Amsterdam example, in May 1981. Nuremberg and Kassel followed, and by 1983 there were 11 science shops in Germany. For 1985, a number of 15-25 science shops is mentioned.

[24] However, Stewart warns against an open call for starting science shops. The large institutions will use their fundraising skills to get hold of the funds without any genuine commitment to the science shop mission. In Stewart's view, this was what killed the "science, technology and society" studies in France.

There was little financial support for the Wissenschaftsladen (WiLa's). Nevertheless, the first years were rather euphoric. Leftist scientists ('68-ers') finally found a method to apply some of their ideals in practice. In 1984, a project on nitrates in ground water by the WiLa Giessen had a national impact and an article in the Nature magazine increased the number of questions drastically. Also the Chernobyl disaster in 1986 led to many questions to the science shops.

The developments in Austria more or less paralleled those in Germany, although they began five years later. Graz, Linz and Innsbruck were among the first successful science shops (Block-Künzler and Graf 1993). Salzburg and Vienna followed, after a good evaluation of the first three science shops by the Austrian Ministry of Education (Gnaiger and Schroffenegger 1997, Pflichter 1994).

4.3.2 Analysis

The developments in Germany and Austria can be analysed according to our theoretical framework:

1. Clients

Workers associations, trade unions and social-democratic parties supported the science shops only verbally, and were not as active as in case of the Amsterdam science shop. However, environmental issues were a good subject to work on during the early 1980s; there were only a few organisations working in this field and environmental analyses could really have some impact. The WiLa Giessen managed to get a 165,000 DM state subvention (approx. 110,000 Euro in 2000) for a project on 'Environmental knowledge for citizens' in 1987, and the WiLa Bonn received European subvention for their training of environmental advisors.

2. Supply

Not much is written on the ways in which scientists and students participated. Most of the work seems to have been done by the WiLa collectives, consisting of students and scientists, and some paid co-ordinators. The WiLa Kassel had about a 100 registered scientists to approach.

3. Hosts

In Germany and Austria, two different models of science shops developed. Some WiLa's were part of a higher education institute, whereas others were established as non-profit associations outside of these institutes.

4. Staff

The WiLa's had only limited numbers of paid staff. The dependence on volunteers was especially important for the non-profit associations, which made them vulnerable to personnel changes. The science shops had a flat, collective structure, in which all the work (including administration) was shared and wages were equalised.

Role of the network and the current situation

The AWILA still exists, though it is not very active. Throughout the years it did maintain contacts with Austrian partners. In autumn 1995 the first international science shop conference of the German language area was held, with participants from Germany, Austria and Switzerland.

4.3.3 Discussion

It is interesting to see whether the type of hosting institute makes a difference to the success of a science shop, since in Germany and Austria both University-based and non-University based science shops exist.

Science shops inside higher education institutes had a hard time surviving. Because of budget cuts in the early 80s, the institutes were even more critical of activities outside the regular scientific tasks. Also, there were not many groups at universities that would actively support science shops; this caused Germany's first science shop in Essen to close as early as 1983. It was re-established as a non-profit association in 1986, with a part-time co-ordinator. (At the same time, the commercial technology transfer office of Essen University was enlarged by 5 full-time positions!) Also in Bielefeld and Hamburg these pressures closed down the science shops. The exception was the WiLa in Kassel, which had about a 100 registered scientists in 1986. The science shop staff was however largely paid from external funds (Ministry of Labour projects). An attempt to get a full-time post from Kassel University in 1990 failed. In general, the institutes for higher education in Germany saw science shops as something of lower rank. There was some hope within the AWILA that the commercial transfer offices would also serve the non-commercial market. This, however, seems only to have been true for the Technical University in Berlin (KUBUS: Co-operation and Information Office for Environmental Issues), which was established in 1986 to serve 'all that traditionally have no access to higher education and research institutes'.

More widespread and initially successful were science shops that were established as non-profit associations. The WiLa Nuremberg was the first to adopt this model. Despite this appearing as a less desirable option (incorporation into the university was not possible), the advantages of being independent soon became apparent. In October 1982, the WiLa Berlin followed. This shop became an example to all German science shops, answering about 250 questions in 18 months. Nevertheless, it closed in 1986, this discontinuity being typical of this type of science shop in Germany: nine out of 12 shops disappeared between 1983 and 1990. All were dependent on volunteers who could only spend meaningful time on projects during their studies or in times of unemployment. Money was obtained from membership-fees (Giessen had 100 members, for instance), gifts and some project grants, but there was a continuous shortage of funds. The science shop in Giessen was the first to obtain a more permanent subsidy in 1992. The WiLa Bonn developed into a professional organisation, which is also very active in training and job mediation. They now have a paid staff of 30, though the majority of their output is focused on job programs, not on research.

The situation in Austria is more or less comparable; there is no significant difference in final success rate for University-based or non-university based science shops.

4.4 Belgium

In 1979 science shops were initiated by critical student groups in Leuven and Gent. In Leuven, students in Social Educational Theory began contacting organisations focused on environment, labour, housing, or feminism, for example, and they solicited some research requests. With these, they contacted the Catholic University and nearby Heverlee College. Contrary to most Dutch science shops, both Belgian shops remained voluntary activities (apart from an occasional intern or conscientious objector who fulfilled his replacement for military service). The Gent shop had to close rather soon because of lack of volunteers, but the Leuven shop continued to operate for a further 7 years at least (Algoed *et al*. 1986). Most projects were on housing, labour, and minorities' social problems. There was a simultaneous

attempt to start a science shop in the natural sciences faculty at Leuven University, within the research group 'Science and Society'. This failed because of lack of staff in the research group. The Leuven science shop succeeded in answering societal research questions (75 projects in 7 years), but it failed to influence the direction of university research and education.

The Science Shop Leuven was organised as a non-profit association, called 'Centrum voor Maatschappijgericht Onderzoek' (Centre for Societal-oriented Research). Staff of Leuven University sat on the Board of the association, which rented an office until money ran out in 1984. Afterwards, the meetings were held in the home of one of the volunteers. From 1985, the science shop was allowed to rent an office at university. Two attempts were made (in 1980 and 1985) to obtain a worker paid by the Ministry of Labour (in its special program for work-experience for the unemployed); both attempts failed. In 1986, a one-time subsidy was received from Leuven University.

In addition to the above attempt in Flanders (the Dutch speaking region of Belgium), the Ministry of Research and Technology of the Walloon Region (the French speaking part of Belgium) initiated an investigation into the possibilities for 'Boutiques de Sciences' in the Walloon provinces. Based on the Dutch, Austrian, German and French experiences, three different options for the Walloon region were described for hosting the boutiques: at universities, at science-cultural centres or at the (future) central office for technology assessment (Liétar and Valenduc 1991). Unfortunately, the study did not result in the establishment of science shops (Valenduc, *personal communication*, 2001).

In 2001, there seems to be some renewed interest in science shops in Belgium, as evidenced by a question in the Flemish Parliament to the Flemish Minister of Education[25]. Also, the science shop of Maastricht University (Netherlands) is working on a plan to start an office at the University Centre Diepenbeek in Belgium, as part of the Transnational University Limburg[26]. This development is part of EU-Region activities that are common in regions at the frontiers of EU member states. This experiment could thus have some knock-on effects.

4.5 United Kingdom

England

In the early 1980s, a number of 'alternative technology centres' were established in England with philosophies on the role of science in society that were similar to those which motivated the establishment of science shops in The Netherlands a little earlier. However, an important difference was that the British students had less time available than their Dutch colleagues in the late 1970s (Turney 1982).

The election of Labour to local governments in the Greater London area paved the way for so-called 'Technology Networks' supported by the Greater London Council (GLC) from 1982 onwards. They were to deal with social problems, including high unemployment rates, which, in the GLC's view, were caused by the Conservative national government. The GLC wanted to make the resources of London's higher education institutions available to workers wishing to develop human-centred technologies. All projects were associated with one or more of Greater London's higher education institutes. The projects were mainly focused on participatory design of new technologies. They received approximately 4 million pounds annually out of city taxes (which would be about equal to 16 million Euro in 2000). In 1984,

[25] Personal information, K. Matthys, University Policy Unit, Department for Education, Ministry of Flanders, 2001.
[26] Personal information, M. Evers, Director Maastricht Science Shop, 2001

Prime-Minister Thatcher threatened to abolish the GLC, partly because of its explicit attacks on her economic policy. The Technology Networks were criticised by the radical science movement for encouraging a technocratic approach ('techno-fix') to complex social problems (Dickson 1984). Moreover, a number of research proposals came from within the institutes instead of outside interest groups (Turney 1982).

In 1989, a science shop was planned at Queen Mary College of London University (Centre for East-London Studies), to be supported for three years by the Nuffield Foundation (Posthuma 1989). It was based on the Dutch example, information and guidelines on its operation being obtained through working visits and conferences.

The 1990s saw the emergence of 'science shops' in Liverpool and Manchester, 'Inter-Change' and 'Community-Exchange', respectively. These science shops offer students the possibility to do a project within a not-for-profit organisation (which differs from an internship in which a student would participate only in the daily affairs of the organisation).

Northern-Ireland

The Science Shop for Northern Ireland opened in 1989, with support from the Nuffield Foundation (Irwin 1995). It has offices in both Northern-Irish universities, i.e., the Queens University Belfast and the University of Ulster in Londonderry. Peter Stringer, who had been working at the Dutch Catholic University of Nijmegen before, was the main organiser for the establishment of the science shop (Stringer 1986). The science shop is now partly subsidised by the National Lottery Charity Board (Martin and Hendron 1999).

4.6 Other European Union member states

The developments in **Denmark** parallel those of The Netherlands. From the mid-eighties both central en decentralised (university-based) science shops arose, which were faced with much the same set of problems in the 1990s as have been outlined above for the Dutch science shops. These problems also led to some closures and reorganisations (M.S. Jørgensen, Videnskabsbutiken DTU, and H. Barcharger, former Videnskabsbutiken, University of Copenhagen; *personal communications*, 1997-2001).

In the late 1980s a science shop was opened at Helsinki University, **Finland**. It was a co-operative effort of many organisations from all over the country, with a small mediation bureau. Funded by the local student union, the shop focused on environment and urban living conditions, and also organised seminars (Posthuma 1989). Posthuma also mentions science shop like institutes in **Sweden**, **Italy**, and **Spain**, but more information on these initiatives could not be uncovered. The same applies to the initiatives in the non-EU countries Switzerland and Norway.

5 Science Shop initiatives in Central and Eastern Europe

This chapter describes the attempted introduction of a science shop in the Czech Republic (Brno) during the period 1994-95, and the successful introduction of science shops in Romania (1998-2000). Both are examples of active Dutch involvement in support of new science shops and they have yielded lessons that should be valuable in future co-operative ventures.

5.1 The Czech Republic

The first active export of the Dutch science shop model commenced in 1994, from Utrecht to Brno. This case has been relatively well documented by Absil and colleagues (Absil *et al.* 1996); all information in this chapter is from that source, unless noted otherwise. Additional information was obtained from the archive at the Utrecht Chemistry Shop, and from interviews[27] with Martin Nawrath (Czech co-ordinator) and Suzana Stroufova (Czech advisory board member) in 2000. Complementary information was obtained from discussions with Arie Fokkink (formerly with Chemistry Shop Utrecht and actively involved in the Eastern-Europe Project).

5.1.1 History

On the 1994 occasion of its 20-year anniversary, the Chemistry Shop Utrecht organised a conference on environmental issues in Central and Eastern (CE) Europe (Chemiewinkel 1994). The invited speakers praised the work of science shops and pointed out the lack of similar ventures in Eastern Europe. Some volunteers took this as a challenge and started to make an inventory of the possibilities of introducing science shops – specialised on environmental issues – into Central and Eastern Europe (Absil 1995). Information on environmental themes and contacts was obtained through contacts with the Dutch 'European Post-graduate Course on Environmental Management' (EPCEM). This course was specifically aimed at students from CE Europe.

In The Netherlands, an advisory board was formed for the project, drawing in members from the EPCEM, the Utrecht-Brno Twinning Programme, Milieukontakt Oosteuropa (Environmental Contact Eastern Europe, a Dutch NGO), the departments of Science and Society, and Environmental Sciences, and the Bureau for International Co-operation of Utrecht University.

The overall scheme for introducing the science shop was divided into four phases:
1. Choice of a city;
2. Theoretical introduction (consulting local universities, staff, NGOs; organising a seminar);
3. Demonstration project(s) to show the potential of a science shop project and introduce methods of project education (format: international student's project under staff supervision and NGO support);
4. Establishing a science shop (office, infrastructure, funding, selecting advisory board, appointing co-ordinators).

The Chemistry Shop Utrecht worked on this project from early 1994 to late 1996. It began with its own funds, and in early 1995 received a grant from the Dutch Ministry of Housing,

[27] Interviews in Brno, Oct. 1, 2000, by H.A.J. Mulder

Spatial Planning and the Environment to the tune of 122,000 NLG (approx. 61,000 Euro in 2000) for phase 3. A 1996 request for an additional 140,000 NLG from this Ministry failed.

The Chemistry Shop in Utrecht was the first science shop to be established (1974) in The Netherlands and it relies heavily on volunteer students (about 20 in the mid-1990s), having a small staff, usually two recently graduated chemists who are temporarily employed (2 years max).

Phase 1:

The city of Brno was chosen as a pilot-project based on the existing twinning relation between the cities of Utrecht and Brno. This pilot was meant as an example for introducing science shops in CE Europe on a larger scale. In other cities, former EPCEM students had already been contacted.

Phase 2:

Based on the contacts of the twinning organisation and Milieukontakt Oosteuropa, two students were sent to Brno to make an inventory of the environmental NGOs and analyse the possibilities for a science shop. Chemistry Shop staff did follow-up interviews and research. Brno has three Universities[28]; this meant both a large knowledge supply potential and an organisational challenge to involve all three.

Phase 3:

The first demonstration project was done in summer 1994. The good results from this project were the reason for a funding-request to the Dutch Ministry of the Environment. The delay in obtaining the grant from Ministry (finally obtained in May 1995) had put great stress on preparing for the 2nd international student project, in the summer of 1995. The projects had to be done during summer holidays, because the Czech students could not incorporate their activities into their regular curriculum. In both projects, six to eight students (from Utrecht and the Brno Universities) worked for 2 months (1 month in Utrecht, 1 month in Brno) on domestic waste issues at the request of the local NGO Veronica.

The report of the second project, 'Separation of chemical waste from household waste: making the citizens participate', and an accompanying public brochure are still being used in Brno and other cities as well. In Brno, there now is a system for collecting chemical household wastes by a 'chemocar', offering free collection at 40 different locations (Nawrath; Stroufova).

Phase 4:

For this phase, starting in the summer of 1996, two Czech student projects under supervision of Czech co-ordinators were planned. Martin Nawrath, co-ordinator for waste-management at the Veronica NGO, was one of them. These co-ordinators were invited for a two-week training session in Utrecht. An Advisory Board had been established in Brno, with members from the three Brno universities and a representative from the NGOs, but it met infrequently (Nawrath; Stroufova). Apart from this official Board, a list of so-called 'supporters' was drawn up and a temporary 'Science Shop' office was set up at Mendel University.

Despite the success of all demonstration projects, a science shop was not established. No further projects were initiated and there have been disappointingly few requests for support and/or technical informational. Some contacts between academia and NGOs have remained, though (Nawrath). The project for Eastern Europe became too large for the Chemistry Shop

[28] The general Masaryk University, the Medel Agricultural University and the the Technical University (VUT).

in Utrecht (it was as big as their normal organisation, and therefore conflicted with their regular tasks), and as a result from 1996 there was an active – but ultimately unsuccessful – search for a new 'umbrella-organisation'. The envisaged large funding proposal to the Matra Projects Programme[29] was therefore not submitted, while a small application to the Dutch Embassy in Prague, submitted by the Czech partners, was not granted.

We will now analyse the reasons for this failed attempt to set up a science shop in Brno by means of the modified Stewart and Kahn model.

5.1.2 Analysis

The Czech case can be analysed in our theoretical framework:

1. Clients

The non-governmental environmental movement grew rapidly since the revolution in 1989, exhausting itself by the mid-1990s, however; the expected changes had not materialised as fast as had been hoped. Co-operation among NGOs was not common, due to lack of time and some mutual mistrust, while networks mainly functioned through western intermediaries. Not many people were professionally involved in environmental NGOs, though according to Nawrath these were generally strong and well managed. Funding options for those NGOs did exist through the Regional Environmental Centres and through contacts with Milieukontakt Oosteuropa.

Co-ordinator Nawrath and his colleague sent questionnaires to NGOs. The questionnaires resulted in many ideas for student projects. The client-NGOs also saw the science shop as a means to interest students to become a member of their organisation (Fokkink 1995; Stroufova). Many requests were based on changes in the Czech environmental Laws, from 1996. Also local authorities were in need of adequate environmental information – they could constitute clients of the science shop as well.
Nawrath, current vice president for the Brno Association of NGOs, still sees a strong demand for science shop services in Brno and the wider Czech Republic; Stroufova agrees with him.

2. Supply

The main problem was that science shop projects did not fit easily into existing curricula which were fairly inflexible, and there were not yet many courses on environmental problems. In addition, universities had yet to implement project-education and/or society oriented education, modularisation and a credit-point system. The operation of the science shop with three universities also caused complications: programs did not match and credit-point transfers were not possible.

For staff members it was equally difficult to participate in science shop projects as there was little history of applied science and co-operation between staff was also largely absent. In the Czech Republic, most professors gave priority to their own research and after that to their private consultancy activities (which most of them had). Teaching had no priority, nor did they have time for other activities such as involvement in a science shop. Some staff members did get involved in the science shop initiative, but it was difficult to find many (Nawrath, Stroufova).

[29] Fund for Societal Transition in Central and Eastern Europe from the Dutch Ministry of Foreign Affairs.

3. Hosts

There had been many thoughts on the best host for the science shop: should this be at one university; a shared (university) office; or an independent NGO? At universities, co-operation among departments and faculties on interdisciplinary research problems was not common. Co-operation among three different universities was even more difficult.

A temporary 'Science Shop' office was set up at Mendel University. This room was small, and Mendel lies outside the city centre. The science shop co-ordinator also worked at the environmental NGO Veronica (again at a different location), from where he also did most of the science shop work. The Veronica office was not able to provide space to house the science shop, but a suggestion to move to the environmental-business-centre downtown was dismissed because it would violate the independence of the science shop (their rent would be cross-subsidised by the higher rent charged to commercial companies).

Both Nawrath and Stroufova agree that a science shop in Brno these days would best be organised as an NGO, though they admit that they do not have an up-to-date overview on developments in Czech higher education and research.

4. Science Shop staff

As long as the science-shop was not well established, the employment of a co-ordinator remained a problem. The organisation needed a champion who was willing to invest his or her energy in the future of a science shop, but the low unemployment rate among academics made it more difficult to find such a person. In Brno, the situation had been different in the first years after the revolution. At the time, people thought everything would change and they were more motivated to make their contribution to the changes. By the mid-1990s, people had to fight more for their individual position. Taking risks by committing oneself to something as insecure as the introduction of a science shop was not realistic. On the other hand it is questionable whether the Chemistry Shop Utrecht gave the right example to guarantee commitment of the Czech participants; in Utrecht there was a fast turnover of volunteers, and even staff, involved. This was also due to the low budget of the project.

Despite these constraints several candidates showed an interest in the position, but for a range of reasons none of them made the big step. The problem was therefore not limited to the recruitment of suitable participants, but extended to a problem with retaining them. The insecurity of the salary and its dependence on the success of project proposals was a definite obstacle. More intensive publicity among university staff members could have been or still is a method to find funds from the university for a co-ordinator's salary.

5.1.3 Discussion

Several factors affected the potential for the science shop in Brno

Socio-political

The relation between NGOs and local authorities was and is rather good, though of course sometimes there were differences of opinion. The local authorities did participate constructively in the international pilot projects.

There were many information requests due to changes in the Czech environmental laws from 1996. According to Nawrath and Stroufova, these will continue due to the preparations for the accession of the Czech Republic into the EU. In addition, Nawrath and Stroufova see the development of Local Agenda 21 as favourable for the establishment of a science shop.

Cultural

For students in Brno, voluntary work was not something especially valuable. After the end of the communist era, a period of 'nothing-for-nothing' has commenced (Absil 1995; Stroufova). According to Stroufova, there was not much environmental awareness among students. There are sufficient jobs and science shop experience is not seen to enhance marketability (Absil 1995); but students may have been interested in the possibilities of going abroad (Stroufova). For this attraction to be successful, at least credit points have to be available for students to participate in the research. However, according to Nawrath, this depends on the persons involved; many students in his view still want to help solve societal problems, but they lack a system, such as a science shop, to do so.

Universities, in general, had some mistrust towards NGOs (Nawrath and Stroufova).

Scientific

Environmental problems – like all social problems – were mostly not seen in a broad (multidisciplinary) context, being reduced to technical issues with management aspects taken into account on occasion.

There was a strong hierarchy in the universities, and a decision was made to organise science shops from the bottom up, with very few contacts at a higher level. This bottom-up approach was adopted on the advice of the Rector of Utrecht University who believed science shops to be typical bottom-up activities (Absil 1995). The Rector thought it would be a good example to individual students and staff, to show that they could make a change if they tried. At the same time, it made the project more difficult. According to Nawrath and Stroufova, there was a lack of young and enthusiast staff members at university.

Funding

The project in Brno depended heavily on volunteers. Even on the Dutch side, continuity could not be guaranteed. Funding was little and late; follow-up funding was not secured. Operating the science shops with three Universities created severe organisational difficulties. The Dutch environmental ministry covered 87% of the project costs; the additional 18.000 NLG (approx. 9000 Euro in 2000) had to be supplied by other funders. Given little experience in obtaining funds for higher education on behalf of the Czech co-ordinators this was very difficult and time consuming (Absil 1995; Nawrath). They could not allocate sufficient time to the project due to their other jobs, and so the required critical mass for the project to succeed was never achieved.

Role of the network

This project was the first one involving intensive coaching of a new initiative, including the supply of foreign funding. Networking contacts with The Netherlands were to some extent troubled by language problems and distance (Fokkink; Nawrath). Also, funding was insufficient to fully maintain international contacts. For instance, there was no money for the Czech co-ordinator to participate in the 1996 National Conference of the Dutch Science Shops in Groningen, which had an international character through guests and speakers from the USA, Canada, and the UK. At this conference, a workshop was organised by the Chemistry Shops of Utrecht and Groningen on starting science shops in Central and Eastern Europe (Groningen's new co-ordinator had become interested in the project). This workshop was part of Utrecht's attempts to transfer their project to another umbrella organisation, and also part of their dissemination efforts to spread their method for the introduction of science shops in CE Europe (Mulder *et al.* 1996).

Nawrath critiques the lack of cross-linking of different networks. Brno has a twinning relation with Utrecht, but when a representative from Utrecht came he only met with the foreign bureau of the municipality. The only exchanges that took place through the twinning agreement were those of popular culture. There were no contacts with NGOs or universities, nor was there any influence from Utrecht to demonstrate that contacts with NGOs are important for municipal authorities and universities.

Conclusion

The project suffered from a lack of (financial) capacity, which made it impossible to solve all practical problems. The main barrier was the way the universities were organised: mono-disciplinary and with tight curricula. Next, organising a joint science shop for three universities was unprecedented and increased the difficulty of this project.

Many of the lessons from the Czech pilot project would be taken into account when starting the science shop project in Romania. This project was initiated by Fokkink, who had been involved with the Brno pilot.

Current situation

Currently, there is no science shop in Brno, nor are there any people working on establishing one. However, the requests on environmental law issues led some students at the Law Faculty to establish the Environmental Law Service. This now has staff involved as well. This service started giving information to individuals, but now specifically helps NGOs in Brno and Tabor.
Also, a new Faculty of Social Studies was established, which operates a special program on human ecology and environmental/social problems. Within this program, students can do an internship with the Veronica NGO. Thus, some of the circumstances for establishing a science shop seem to be improving gradually (Nawrath and Stroufova).

5.2 Romania

At the end of the 1990s, the Chemistry and Biology Shops of Groningen University received a grant from the Dutch Ministry of Foreign Affairs to facilitate the start-up of science shops for environmental issues at four Romanian universities. This chapter describes that project, which has so far been quite successful. All information was obtained from the authors' Mulder and Teodosiu's personal involvement in this project, unless noted otherwise.

5.2.1 History

The project emerged from a simple question by a representative of the Ecolife NGO, in Bacau, Romania to Arie Fokkink, formerly of the Chemistry Shop Utrecht and actively involved in the project to start a science shop in Brno: 'Couldn't you start such a science shop here?'. Fokkink was working in Romania for various organisations at that moment, and had learned the Romanian language. He then started visiting Bacau University, and got support from Prof. Mazareanu, head of the department of Biology. This was late 1996. Early 1997, he contacted Henk Mulder at the Chemistry Shop in Groningen. Together, they prepared an application to the Dutch Ministry of Foreign Affairs. This Ministry has a special fund to support the transition in Central and Eastern Europe (Matra). The science shop-method fitted in well with program targets as 'strengthening environmental NGOs', 'environmental improvement' and 'improving legal security of citizens'.
When the proposal (Mulder 1997) was submitted, summer 1997, the Ministry demanded both a budget reduction and that science shops be set up at more than one university. Fokkink

and Mulder selected two more universities; the Al. I. Cuza University in Iasi (with whom Groningen University already had some co-operation) and the Dunarea de Jos University in Galati (based on intensive contacts that Fokkink had with a large NGO, Earth Friends, in that city). Both Iasi and Galati are in the same region as Bacau, Moldavia, which was a precondition to prevent excessive travelling. Early fall 1997, Fokkink and Mulder visited these universities and several NGOs in Romania. At the Cuza University, the visit was arranged through the Bureau of International Relations. A young lecturer in Biology, Mircea Nicoara, was appointed as a host (he was also Socrates co-ordinator). In Galati, the visit was prepared by Mrs. Lucia Georgescu and a colleague NGO member; both were connected to the university as well. Already during this first visit many administrators, Rectors and Deans, were met and introduced to the science shop method. In Iasi, Fokkink and Mulder visited the Technical University Gh. Asachi as well, on an impulse, because their administration was located in the same building as Cuza University. Through the Vice-Rector for International Relations, the first contacts were established, and some professors were met later (including future co-ordinator Mrs. Carmen Teodosiu).

This visit was financed from Chemistry Shop funds, with 50% support from the University of Groningen's Office for International Relations. A renewed proposal was submitted to the Ministry in December 1997, now for four science shops, and at a reduced budget of 350,000 NLG for the two year project (equal to 165,000 Euro in 2000). All partners contributed in-kind by supplying office and facilities and some staff time for supervision of their own students in projects; there were no direct financial contributions. Attached to the proposal were letters of support from the universities involved (signed by the Rectors), as well as letters of support from various NGOs and civil society development organisations, which had also been visited during the November 1997 trip. The project was granted and started in September 1998. The Dutch project team consisted of Mulder and Fokkink (through his new company Green Grid Consultancy) and Mrs. Attie Bos of the Biology Shop Groningen.

Project outline

Contracts were signed with the Romanian Universities, in which they agreed to allocate office space to the science shop and all facilities normally offered to staff and students. They also agreed to make it possible for students to participate in science shop projects in their regular curriculum as soon as possible. Finally, they agreed to take over the exploitation budget after the Dutch-funded project would end (excluding salary costs, on which they agreed to co-operate in finding funds). From the project funds, the salary for one full-time co-ordinator would be paid per shop, as well as an annual exploitation budget. As an extra, there was money to buy a computer for each shop. The Dutch team was paid for one part-time function in total, to be shared by the three persons involved.

During visits by the Dutch team, the Romanian Universities would solicit co-ordinators, which would be interviewed and appointed jointly. The Dutch team would coach the work of the Romanian shops and assist in fundraising. Also, with every science shop one international student-project would be done, based on the examples of the Utrecht-Brno co-operation. These projects would serve as a pilot-project to demonstrate the potential of a science shop project. These projects were to be combined with a visit of the Romanian co-ordinators to The Netherlands, for training and setting up contacts. Because this visit came at a moment where each of the co-ordinators had gained working experience of about a year, this working trip allowed them to acquire high-level extended value from it.

In November 1998, the first Romanian science shop was established, at the University of Bacau. Science shops at the other universities were established from February to May 1999. All shops use the name 'InterMEDIU', which is linked to the word Intermediate. Since 'mediu' means 'environment' in Romanian, it is clear in what field these 'research and information/consultancy centres' operate. The Romanian centres are organised either as

independent non-profit departments of the Universities (Iasi Technical and Galati universities) or managed by a specific Faculty (Iasi Cuza and Bacau universities). A board of supervisors (with members of the faculty council and university senate and members of the Dutch project team) is responsible of the general activity, as well as changes in statute or mode of operation.

5.2.2 Analysis

The InterMEDIU's are modelled after both Groningen Shops. Below a detailed description is given of the agents involved.

1. Clients

In Romania, there are many NGOs, though not every one of them is very active. Many NGOs are linked to political parties, which does not help create mutual trust among them. Some NGOs are linked to members of the faculty, some have many student-members. These NGOs were among the first contacted by the project team. Organisations that work with NGOs were also visited[30], both to learn from their work and contacts (and vice versa) and to prevent duplication of effort.

Since NGOs were not equally active in all cities, three important decisions were made:

- People that wanted to start NGOs would be actively supported (Bacau) or people would be asked whether they wanted to participate in improving environmental conditions (Iasi TU).
- A pilot project would be done on an issue known to be important to many people, without a direct client organisation (Iasi TU). This would show the potential of science shop projects (in this case, the project was on quality and quantity of drinking water supplied in the city of Iasi; in Galati this project was copied on request of the local Water Company).
- Local and regional authorities were welcomed as client or partner, too; for environmental problems even industry was accepted as a client (Iasi TU, Galati). Since the current economic situation of industry is bad, doing research on their behalf was not seen as conflicting with science shop ideology.

Tenants organisations are very well organised in Romania, but not yet involved much in environmental actions or policy making. In the project proposal they were seen as potential clients, with questions relating to energy efficiency. Until now, no questions have been received, however. On the other hand, it turned out that schools – at all levels – were very much in need of scientific support, i.e., to start environmental education. All InterMEDIU's now have a continuous environmental education program with a large number of schools and NGOs.

All InterMEDIU's have set up good press contacts and receive a lot of media coverage. Presentations are held on seminars, NGO meetings, student conferences, and so on. During environmental crises, such as large toxic pollution in the Danube, many individual citizens found their way to InterMEDIU to ask for information.

2. Supply

The research at InterMEDIU is to be done by students, under staff supervision. In order to make it possible for students to participate within their curriculum, two strategies were followed:

[30] Such as Milieukontakt Oosteuropa, a Dutch NGO working to support Central and Eastern European environmental NGOs, the Romanian Civil Society Development Foundation (both national and regional offices), the Soros Foundation for an Open Society, and the NGO Information Center in Galati.

- Allowing students to write a paper, or even their diploma project or master's thesis, on a subject from InterMEDIU, or fill in a practical period with work for InterMEDIU. With the collaboration from the professors responsible for these already existing parts of the student's education, this change can be made swiftly. In practice, the staff members directly involved in InterMEDIU (i.e. as co-ordinator or board member) were the first to allow this in their own courses and practical periods, and gradually other professors are allowing the same.
- Changing the study program in such a way that a new course is introduced, which allows for science shop projects to be incorporated in it (or making the 'science shop project' as such a part of the curriculum). The Department of Biology of Bacau University introduced the optional course 'environment and society' for this. Optional courses can be realised only when a certain number of students apply for them and also if they are officially approved by the University Senate and the Ministry of Education. Changes in the curriculum officially apply to a new cohort of first year students. This means that there is a delay; it takes a few years before these students are in their 3rd or 4th year in which they could actually take this course.

In Romania, many students participated in InterMEDIU projects as volunteer. The applied science and multidisciplinary aspects were very appealing to them, just as the international atmosphere with InterMEDIU and their relatively good facilities to go for information or to do research (including internet access). There usually is a changing group of 20-40 students continuously involved in any InterMEDIU.

3. Hosts

The target of the project was to unlock the knowledge that was present at universities, for solving societal problems. This led to the straightforward decision to start science shops as university departments (modelled after the Groningen science shops). Since the first contacts were positive, there was no reason to try a 'stand alone'-NGO version as an alternative. For universities, the science shops were an interesting option because of the international contacts and the innovative type of research and education. All universities involved donated office space and furniture, as well as all other facilities normally offered to staff and students; all the rest of the expenditure came from the project budget. Contacts of the Dutch team members with Rectors and Deans were very important to ensure their support.

The financial situation at Romanian universities is far from good, which makes it difficult to find internal funds for running a science shop, since even small overheads can mean a substantial burden to the faculty or university budget.

In the project, several bureaucratic hurdles had to be overcome, e.g., in financial management and organisational structure of the science shop. The solutions were tailor-made and different for each science shop:

- One shop is part of a department for biology, to maintain the best contacts and support from faculty.
- Two others are established as separate departments within their universities, giving them more autonomy. One of these became part of the university's *Centre of Excellence*, the other was recognised as the *Centre of Excellence* itself.
- For one science shop, efforts were made to turn it into an NGO. This would increase funding options (regular subsidies for NGOs come from different sources than university funds). Faculty members of the Biology Department would be in the board of this new NGO. The initiative failed because of all of the bureaucracy involved, especially in trying to maintain the positive aspects of being closely linked to the university (i.e., close and formal contacts to scientists, students, university board, use of office space and facilities). The science shop Bacau now remains within the biology department.

From these examples it is clear that there are many positive aspects in any organisational form; the best solution will depend on all local circumstances and the host university.

4. Science Shop staff

In the original project proposal, the plans were to hire one co-ordinator per science shop. It proved difficult to find someone who wanted to take this full-time job, with insecure prospects and many demanding tasks. There were however a number of people who were interested in doing the job next to their regular job. For Romania, combining a full-time job with another is not exceptional. Thus, at all InterMEDIU's two co-ordinators were employed part-time.

Some of these co-ordinators already had a tenured staff position at university. This proved very favourable to the project. Not only did they have a lot of working experience, but they had some seniority as well which enabled them to get things done within the university hierarchy and also to attract students for the science shop work. Fortunately, the budget allowed for paying the salary accordingly to the work experience as well. Through this construction, two categories of Stewart and Kahn's model ('supply' and 'staff') become superimposed, which is also the case for a limited number of other science shops (e.g., some of the de-centralised science shops in Holland and some Community-Based Research Centres in the USA).

Some of the other co-ordinators were recently graduated masters of science that wanted to start or had started a PhD study. Of this group, three people left to study abroad. Because of the fact that all work had been shared with colleagues, their leave was not disastrous and new co-ordinators could be introduced into the work rather smoothly. The departure of young scientists is however quite common in Romania these days.

A few aspects of the work of science shop staff are presented below:

- the co-ordinators' profiles and their involvement in the science project are very important, because this type of activity is new and demands efforts to organise it, to make it visible inside the universities and within civil society, to establish contacts with the mass-media and different educational bodies. In Romania, the science shop co-ordinator should have the combined qualities of a university staff member, a project manager, an active NGO member and also good secretarial and language skills. If two persons are hired at the science shop, it is highly recommended that they have different previous work experience (university and community/NGO experience is probably the ideal case).
- a strategic plan for science shop development and involvement in projects is also a must in the actual situation of the Romanian universities.
- good contact with university departments as well as examples of successful projects attract both the co-operation of students and also of other staff members, strengthening the science shop position. Thus, the international projects, diploma projects of the students on science shops subjects or the pilot projects are only few examples on this issue.
- a common issue for other science shop members of the international community is recognition at academic level and the possibility to publish their work in peer-reviewed journals (for university staff members this issue is very important). This problem may be solved by the future network and science shop magazine.

5.2.3 Discussion

To understand the developments in Romania, we can place them in Romania's current socio-economic state. Important to the development of science shops are the current environmental problems that require attention, the start of an organised, democratic civil society structure and the reform of higher education.

‘Environmental issues’ were not valued as they should be in Romania, before 1990, even though the country was highly industrialised and agriculture was practised in an intensive way. Development of environmental laws, regulations, monitoring, environmental education and research after 1990, contributed to the restructuring of many industrial enterprises and also to the founding of environmental institutional structures.

Even if the overwhelming problems of day-to-day life in Romania are of a social and economical nature, environmental protection and increased awareness are factors that can contribute also to sustainable development and European integration. It is here that science shops can play a role; the project to start science shops in Romania was triggered by the wish to solve environmental problems through the unlocking of domestic problem-solving capacity.

Education is free and compulsory from ages 7 to 16. State and private universities are located in the major cities, post-graduate, M.Sc. and Ph.D. studies being offered by state universities with tradition in higher education. There is some reform going on in higher education in Romania. Project-education and distance learning are new themes. Especially Technical Universities already have experience with applied research. Most universities are interested in developing international contacts, which makes co-operation projects on science shops feasible as well.

University education is still in a process of reform in Romania. Thus, even if the students receive very good quality information related to a variety of disciplines that can provide the background to their future work (‘specialisation in a specific field’), their involvement in projects during faculty years, as well as their capabilities to work in multidisciplinary teams or with societal requests are not well developed. Especially for environmental issues where multidisciplinary work is absolutely necessary and in many cases technical solutions have to be analysed also in relation to community requirements, project-based learning can offer students the possibility to use their specific knowledge in order to solve a specific problem, and also can be an asset for their further employment. Science shops can also add value to various disciplines by offering case studies of research realised for the community on a specific problem (air and water quality, waste management, environmental education) (Teodosiu and Caliman 2000).

The modernisation of curricula by introduction of the credit point systems in all Romanian universities can respond to at least some of the major challenges that universities have to face in order to assure a modern education of their students:
the inclusion of new attributes such as: flexible modules for learning, improved co-operation with industry and communities, independent work, problem-based learning
international exchanges and international co-operation projects expansion of open and distance learning education for under-graduate and post-graduate studies (Barzea et al. 1998; Neculau 1997; Phare 1998)

Professorial councils and academic staff of all universities involved in the project appreciated the contribution of science shop work as very positive to the formation of students. This fact is recognised as well in the letters of support for a new proposal in project-based learning, and also by allowing students to realise practical periods, diploma projects or research contributions for their M.Sc. and Ph.D. programs within the science shop. Moreover, in the case of TU Iasi, the M.Sc. distance learning program in Environmental Management is organised by InterMEDIU in co-operation with the department of Environmental Engineering. Seminars on the results of science shop projects were encouraged by all universities, and also the presentations of science shop activity in the educational section of a specific conference (Bacau). Students involved in science shop projects (national and international) won prizes in student contests for research activities.

Depending on the specifics of the research and the university profile, fieldwork or experiments may be valued higher than literature research, but there is a general tendency to modernise this concept as well, with opening to the application of social sciences and inter-disciplinary co-operation.

Civil society

Once part of the Roman Empire, as its name and language indicate, Romania[31] has had a long and eventful history. At various times its territory has been occupied by Hungarians, Turks, and Russians, but after World War I Romania emerged as a united country (a constitutional monarchy until 1947). Romania was a socialist republic controlled by the Romanian Communist party, with many dictatorship components due to ideology and also endeavours of some communist rulers. It was a member of the Soviet bloc for more than 40 years until the 1989 revolution toppled the Ceausescu regime.

Democratic development for Romania implies socio-political changes from a dictatorship to multi-party democracy, which are also the key issues for the involvement of civil society as potential clients of the science shop. Speaking about Romania, communism destroyed the normal structures of civil society. For many years, people were afraid to defend their opinion (if it was contradictory to the dominant ideology), being 'educated' not to have comments on economic, social, environmental or any other issues. Any other attitude was regarded as a political implication, with consequences of various kinds (interviews with the *Securitate* or party leaders, dismissal from jobs, or even prison). A stronger civil society is thus still in the making; science shops can help with this.

The current financial situation of state- and private enterprises in Romania, in combination with the environmental problems they encounter, makes accepting their questions at this moment in line with the science shops' mission.

Romania's status as a developing country is also associated with the difficult transition from a centralised, state-owned economic system to a market-based economy, sustained by private property and based on economic efficiency. Given the political, financial, social, and economic conditions inherited from the communist period, reform programmes introduced in 1990 determined devaluation of the currency, removal of subsidies on most consumer goods. Compared to other countries in Eastern Europe performance of the economy is not yet very good, especially due to lower foreign investments and a slower privatisation rhythm.

Funding of the project

The money from the Dutch Ministry of Foreign Affairs was used to start up this project. The total budget was reduced after the first attempt at obtaining finance, in order to secure at least some funds. This meant that the budget finally obtained was not totally sufficient, so a lot of spare time was put in by all involved, and travel had to be kept as inexpensive as possible.

Fundraising was a time-consuming part of the project. Every InterMEDIU worked on this from its own perspective, whereas the Dutch team co-ordinated the search for funds to sustain and expand the science shop system as a whole in Romania. For this, contacts were made

[31] The population of Romania is more than 23 million. Of these the majority (88 percent) are Romanians. There are about 1.8 million Hungarians (about 8 percent of the population), 371,000 Germans, 255,000 Gypsies and about 26,000 Jews. The Romanian language is a Latin language, similar to Italian and Spanish, but containing some Slavic words. The Romanians belong mainly to the Romanian Orthodox Church, which received in the last 10 years considerable government recognition and support. Most other Romanians are Greek Orthodox, Muslims or protestants. About 53 percent of the population live in cities. The largest city is the capital, Bucharest (Bucharest), with more than 2.3 million inhabitants, or about 19 percent of the urban population of the country. Other large cities are Timisoara, Iasi, Brasov, Cluj-Napoca, Constanta, Galati, Craiova.

and maintained with the Soros Foundation for an Open Society, the World Bank, the Ministry of National Education in Romania and the Dutch Ministry of Foreign Affairs.

Role of the network

The Romanian national network allows for copying best practices and mutual support. For example, an information manual for students was produced collectively, based on the Groningen example, and the details of special tax arrangements for science shops were shared (non-profit, VAT-exempt status). At one national meeting a Romanian specialist was hired for PR training.

The international network that was accessible through Groningen created closer contacts to a number of Dutch science shops, and opened contacts through the internet to colleagues world-wide (such as the SCIPAS project, individual Socrates co-operations, Leonardo proposals, a joint US-AID proposal, etc.). Through contacts with The Netherlands, books and equipment were also obtained - both of which are very much needed in Romania.

Current situation

Most InterMEDIU's have obtained some project grants and established longer-term projects to generate income through, for example, the Centres of Excellence, by developing distant-learning courses, and through small paid projects and analyses (consultancies). The main problem is to finance salary payments (the core financing); small expenditures for exploitation are more easily covered from individual projects.

A follow up proposal was submitted to the Matra Program in 2000 (Mulder 2000). This aimed to start up four new science shops, and support the four existing ones with a decreasing subsidy (75-50-25% over three years). In parallel, it was hoped that project negotiations with the Romanian Ministry of National Education might lead to a national system of financing science shops (even if this depended on international funds obtained through the Ministry).

Hoping to increase multidisciplinary co-operation, the proposal focused on renewal in higher education (i.e., introducing problem-based learning), as opposed to a focus on the environmental benefits of science shops, the emphasis of the first project. This was a strategic decision based on shifted funding priorities in the ministry (including the Matra programme). However, the beauty of the science shop method is that it serves both goals at the same time.

Unfortunately, the new Matra project has not received support from the Ministry[32]. The main reason for this was that the Ministry was not convinced of the financial sustainability of the project, in addition to the fact that the budget was higher than in the previous project (which had been done with more spare-time input than could be repeated).

There were some differences between the Romania and 'Brno' projects which in our view added to the Romania initiative being currently more successful:

- A Dutch team member had extensive knowledge of Romania (including language skills and a relevant network inside Romania);
- In Romania, contacts were also made at higher university level (Rectors, Deans), and bi-lateral agreements were signed with all four universities;
- The Romania project obtained more funds;
- In Romania science shops were set up at one Faculty or University, so they did not face the practical problems of a shared office for several universities;

[32] Ministry of Foreign Affairs, The Hague: *Letter of December 27, 2000.*

- In Romania, science shops started up at more universities which allowed the establishment of a regional network;
- Since this initiative included a small number of universities and provided for a relatively short time for the consolidation of Romanian science shops, the support of both the Romanian Ministry of Education and the international community (network, Matra, EU funding) is essential for the existing shops and for the creation of new ones;
- Training of science shop staff was undertaken on site by the Dutch team, and Romanian science shop staff visited different science shops in The Netherlands (as part of international projects). Science shops could benefit of the future EU network by means of more diverse training programs, including those in community based research;
- Matra subvention is rather well suited for this type of project. Most Central European countries are eligible for this; but also Turkey will be Matra-eligible from 2001.

The method to choose a city or university for co-operation worked well in both cases, as well as the reconnaissance trip to discuss the science shop project with all agents involved.

6 Science Shop initiatives outside Europe

In this chapter, developments on other continents are described. Detailed cases are described for Israel and South Africa. In Israel, an incubator structure initiated in 1997 to illustrate the potential of science shop work, while in South Africa, a science advice unit was started independently of the European science shop movement and functioned between 1995-1998. Science Shop start-up activities in Australia, North America, and South-East Asia are briefly described.

6.1 Israel

This chapter is based on the personal involvement of author Ronen Goffer, unless stated otherwise.

6.1.1 History

The idea of community-based research (CBR) and the existence of ‘science shops' came to the awareness of the establisher of the Mimshak Program in Israel, Ronen Goffer, in the middle of 1996. It all started with getting and reading one of the Loka-Alerts as published by the Loka Institute. Since Goffer was in a search of some kind of practice that would connect ‘science' to ‘society’, the science shop method seemed one of the best practices for that.

The idea arose, at the end of 1996, to establish a science shop in Israel. Through the Loka Institute (Dick Sclove), a connection to Henk Mulder of the Science Shop in Groningen, Holland, was made and a tour to 10 science shops in 5 universities in Holland was undertaken in September 1996.

Prior to the tour in Holland, an agreement between Goffer and the Haim Zippori Community Education Centre in Jerusalem, Israel, was made. Zippori Centre, a 4 year old centre at that time, is an NGO that mostly trains all kinds of people that work with communities, and in general has the mission of dealing with the entity of community, theoretically and practically. Zippori Centre is located outside of university but has strong connections with scholars and departments in universities in Israel. Zippori Centre has agreed to serve as an incubator for the idea, including paying the salary (full time) of Goffer. The support of Zippori Centre did not include finance for research projects, and raising the funds for that was considered to be part of the enterpreneurship of the Mimshak Program. The name ‘Mimshak' (קשממ) derives from the initials of the name of the program in Hebrew, and it also means ‘interface' – symbolising the interface between community and academia that is embodied in the action of Mimshak.

Mimshak focuses on mediation and dialogue between grassroots groups/groups of concerned citizens, NGOs, communities and the academia. The purpose of the program is to carry out participatory research which deals with issues and problems that are of concern to particular communities and groups. This, in order to provide these communities with professional knowledge to be used in dealings with various authorities (government, local government, planning authorities, health establishment, etc). Mimshak embodies an interface between the academia and communities that search for relevant knowledge to enhance their interests.

The formal ‘Mimshak Program' was established few months after the trip to the Science Shops in Holland, and after preparations in Israel. The preparations included many talks with

scholars from academia, communities. NGOs etc. The purposes of Mimshak were defined to answer community and academia as well (empower communities and groups with the tools of participatory research; encourage academic research that has social relevance). The sentence ‘democratising science and technology' was left out of the texts of Mimshak. The reason was that it wasn't understood nor approved by people that were connected to Mimshak from academia, including those in Zippori Centre. In the past few months, the Director of Zippori Centre and other staff members started on their own initiative to use these phrases as part of Mimshak mission.

Only a few pilot projects would be carried out as a first step. Strategic actions would be done to establish a new research channel in Israel – community-based research. This meant that a main funder (private or governmental) was to be found. For this, there have been discussions with the universities and the Kenesset (House of Parliament) Committee of Science and Technology.

6.1.2 Analysis

After studying the various issues concerning operating a Science Shop, decisions and actions were made on levels concerning 4 actors:

1. Clients

All kinds of communities, grassroots organisations, and NGOs were approached with the question of whether the service of Mimshak was needed by them. The meetings took place in the communities’ locations and not in the Zippori Centre. The existence of Mimshak was not publicised very widely on purpose. The aim was to have 2-3 pilot projects. It was decided that the projects would not be too ‘big' or too ‘little' (average of 9 months). After a while, communities have started to approach Mimshak on their own initiative.

During the period of 1997-1999 dialogues with 40-50 communities took place. It was clear by that time that the service, offered by Mimshak, was needed and wanted by communities and groups. During that period, three communities were picked for three research projects. All them of them came from the areas of Environmental Studies, Public Health and Urban Planning.
During the efforts to raise funds to various kinds of projects it seemed that it was easier to do so for environmental research projects then others.

Each pilot project cost about 12,000$. The money was raised from private funds and governmental sources. The projects are:
1. The bilateral relations between the community and its industrial areas. The project was carried out with a group of activists from Pizgat Zeev, a community in Jerusalem;
2. Analysing of existing water quality data. The project was carried out with ‘Citizens for the Environment in the Galilee', an environmental NGO;
3. Air contamination in Nesher, a northern city. The project was done with a group of activists from Nesher.

The civil society in Israel that is organised by NGOs and groups developed strongly over the passed 10 years. Many organisations were established and work towards various ends, though many of them have a small budget and can’t afford paying for a research. That is why it was decided for the first three pilots to give the service of Mimshak for free. It was considered a good decision, although it might hurt a little the motivation of the group to be committed to the research project. We learnt that a fee (even a small one) would be asked from the groups in future.

2. Scientists

It was estimated that it is too difficult to raise two ‘flags' at the same time: community-based research and working with students as part of their duties in university. Therefore, and because the Mimshak Program was based at the Zippori Centre, not at a University, a paid researcher was hired for each pilot project. Generally, there are social projects in Israeli universities that are being carried out by students and this phase of Mimshak was left to the future.

The decision of working with paid researchers was taken by Mimshak Program in order to let pilot projects be carried out without handling deeper issues of community-academia relationship. Generally, researchers in Israel are very much concerned with their own academic progress, and can’t benefit, professionally, from ‘soft' activities like working with communities. On the other hand, one can find more and more researchers that understand the importance of a relationship with community. In retrospective, these decisions seem crucial concerning the success of the program.

Most researchers that were approached, understood the importance of this kind of research and were willing to work for it. All researchers that were selected to do a research, were connected to universities.

3. Institutions

Generally speaking, universities in Israel are going through the same processes like in other western countries: budgets are going down and universities are looking for ways to be more efficient. All seven Israeli universities are public. In the past seven years new colleges (that are recognised by Council for Higher Education) were established but they don’t do research (yet).

The Mimshak Program was set up at the Zippori Centre, as an incubator for Science Shop introduction in Israel. However, it was decided that the Program would be called ‘Community-based Research Program' and not ‘Science Shop', symbolising the institutional context of Zippori Centre, which is outside of the university. Since Zippori Centre was located outside of university, it was decided not to follow the Dutch model of research projects that are being carried out by students.

During the time that Mimshak was shaping its own practice of community-based research by pilot-projects, it was simultaneously in dialogue with the establishment including, universities and the Kenesset (House of Parliament) Committee of Science and Technology. Discussion partners were heads of universities, heads of departments in universities, the chairman of the Kenesset's Committee of Science and Technology, the head of Israeli Council for Higher Education etc. This in order to establish research channel in Israel that will supply the research needs of various communities and groups.

The most successful dialogue is taking place now with The Council for Higher Education. The Council is responsible to overall budget of all universities in Israel and has stated in the first talks that it is interested in financing Mimshak Program. Few reports were written about the possible action of Mimshak (with universities, through The Council for Higher Education). The last report was written in July 2000. The whole proposal is about to be discussed in 2001. The proposal that is going to be discussed is for a general fund for Mimshak’s projects. After approval of this proposal, a relationship with each university will be constructed, including working with students.

The work of Mimshak Program has effected the mission of the Zippori Centre, and a Department of Participatory Practices has started working from Jan. 2001. This department will carry our various practices (like in The Loka Institute): Community-Based Research,

Citizen-Based Consensus Conferences, Scenario Workshops etc. Among that, more personnel will be added to Mimshak Program.

4. Staff and operation

A steering committee was established, including professors from various universities, representatives of community establishments etc. All that time, Goffer was the only person working for Mimshak Program. He was backed by Zippori Centre and the steering committee, and for each pilot project a paid researcher was hired.

About 30 different sources of funding (private and governmental) were approached. It became clear that non-of them, at that time, were interested in funding infrastructure of Mimshak. Some of them were interested in specific projects. The funding for those three pilot projects was raised successfully.

6.1.3 Discussion

The three pilot projects of Mimshak are about to be successfully concluded. Although potentially a lot of research projects can be carried out, Mimshak Program rather waits to see the results of the strategic actions. The main reason is that the mode of operation of the pilot-projects (dialogue with a community; defining a research question; raising funds; carrying out of project) is not suitable for wider operation (calling many communities and groups to approach Mimshak). The fund-raising factor is too uncertain and takes too long (up to a year). This can cause disappointment in the community, and can even mean that research results become available too late to have an influence on planning or policy procedures.

A breakthrough with the dialogue with The Council for Higher Education is expected in the beginning of 2001. If not, an alternative mode of operation will be considered. This mode of operation will include the former actions (more pilot projects and strategic actions), and signing agreements with universities and departments to establish a Dutch-like mode of operation.

Results and conclusions

1. The international network works: the already functioning regional networks of Science Shops and Community-based Research Centres (CBRCs) were the main factor of transferring the knowledge to built the opportunity to establish a Science Shop or CBRC in Israel. There is no doubt that it would have been impossible otherwise.
2. The establishment of Mimshak in an institution like Zippori Centre has effected, positively and less positively, the purposes and mode of operation of Mimshak.
   It has effected the approach of Mimshak of being very interested in the usage of the participatory research results and integrating authorities into the process.
   It has predetermined the mode of operation that does not use students as researchers.
   The wide networks of communities and groups in Israel were accessible to Mimshak, as a result of being part of Zippori Centre.
3. As mentioned, the participatory process that was built by Mimshak was concerned with results, and became a process that involves the community very widely (up to 15 meetings with the working group of the community).
4. Once establishing a CBRC or a Science Shop in a country that doesn't ‘know' about the ideas of community-based research, one has to act on both levels simultaneously: doing the actual practice and do strategic actions as mentioned. Otherwise, the ‘concept' will die when projects (or efforts for raising funds for them) are finished. The main purpose for strategic actions is for building a sustainable infrastructure for a Science Shop or a CBRC.

5. Public relations are important: in Mimshak's case, the positive attitude of the head of the Council for Higher Education was effected by a large article in the newspapers.

6.2 South Africa

This chapter is based on the personal involvement of author Thomas Auf der Heyde, unless stated otherwise.

6.2.1 History

Although it was not called a 'science shop', there has been one attempt in South Africa to establish an institution that strongly resembled these organisations. The Science Advice Unit (SAU) was first mooted at the University of Cape Town (UCT) in 1995, but was closed in April 1998, when its director and founder left the employ of UCT. Although the SAU achieved some measure of success during its three years of operation, it was unsuccessful in establishing itself as had been planned originally. For this reason, the following analysis of the SAU draws on actual experience gained, as well as the plans that had been formulated for it.
In establishing the SAU, the priority target 'clientele' for its services were socially and economically marginalised groups such as civic organisations, trades union, environmental groups, non-governmental organisations (NGOs). For these clients, the SAU intended to:

- facilitate access to the scientific and technical resources of the university;
- facilitate outreach and extension services by departments of the university;
- empower them to participate in national science and technology policy processes;
- assist their political representatives in their dealings with science and technology policies and issues.

A secondary objective was to assist – on a fee basis – small, medium and micro enterprises who had need of specific science and technology assistance that could be sourced in the university domain.

6.2.2 Analysis

1. Clients

From the outset, strenuous attempts were made to link the SAU closely to its target clientele: civil society organisations, trades union, environmental groups – parties that would require support in scientific and technical matters but who generally lack the resources to procure such support at commercial rates. Through a number of projects good links were established, and the SAU received letters of support from a range of organisations in its quest for funding to ensure the continued operation of the unit.
SAUs interaction with clients was determined by both 'push' and 'pull' factors: the founder of the SAU would scout out needs and opportunities in the target constituency, while some approaches were also made to the SAU for its services.

2. Supply

As outlined below, the SAU was mostly managed as an individual research project by its founder, with part-time assistance from two postgraduate students.

3. Host

The SAU was based in the Department of Chemistry at UCT for the main reason that its founder was employed as an academic in that department. Mostly, the unit was operated as the equivalent of a personal research project of its director. From its inception, however, the SAU was intended to serve the entire Faculty of Science, with whom it networked extensively. The unit was never represented formally on any university structures, operating instead as a special project that reported (not all that formally) to the dean of the faculty. Support was also extended by more senior officers of the university including the deputy principal and deputy vice-chancellor for research.

4. Science Shop staff

At its most active, the SAU drew into its work the activities of its director (in a part-time capacity), two part-time student assistants, and an occasional administrative helper. For this reason it was very horizontally 'organised'. Had the SAU developed as hoped, it would have been headed by a part-time director, while employing two or three project officers, an administrative assistant, and any number of students (both part-time paid and voluntary). The mode of operation would have been collectivist as is typical for non-governmental organisations (NGOs) of this type and size.

Hence, while the SAU was conceptualised as a non-hierarchical organisation aimed at assisting socially marginal groups in a collectivist manner, it was strongly driven throughout its activities by its founder, whose vision for the SAU was a strong factor in deciding its projects and profile.

6.2.3 Discussion

Socio-political context

Most of the rationale for and experience of the SAU can be understood in the context of a significant shift in the socio-political and economic environment of South Africa that started in the early 1990s, and accelerated after the democratic elections of 1994. Political processes of all kinds were suddenly thrown open to participation by any concerned citizen; public and private organisations came under massive pressure to transform their focus, activities and mode of operation to reflect the priorities of the new government; government itself became and had to be seen to be more responsive to popular demands.

The effect of these changes was to stimulate higher education institutions into developing more visible and public extension and outreach programmes, and a whole new industry of NGOs was spawned. These developments were largely aimed at those social groups that had been most egregiously marginalised under the apartheid regime: the urban black working class and rural black peasants. However, significant effort was also made to develop links and alliances with the emerging political class as it represented these constituencies.

UCT was also caught up in these developments and there emerged a number of initiatives that aimed to extend technical support to these marginalised communities and their political representatives; the SAU was one of them.

Another very important socio-political aspect was the increasing emphasis on 'corrective action' – to use a South African term used to describe a policy that encourages transformation of the demographics in organisations and social life. This concept finds expression in a range of policies such as (institutional) appointments policies, national funding and tendering policies, and so on.

Against the background of this policy the following were important considerations:

- UCT was a historically white institution that had enjoyed comparative advantage during the apartheid era;
- universities who had historically catered for black students now needed to be strengthened, earmarked funding being made available for their development;
- UCT is closely located to the leading historically black university, which draws much of its students from the target clientele of the SAU.

These particularities made the establishment of the SAU especially difficult. Foreign funders took their cue from national funding agencies, all of whom encourage and practice corrective action, and in the end the SAU was refused funding literally on the basis that while it was acknowledged as an extremely worthwhile initiative it was based at the 'wrong' university.[33]

Cultural context

There was historically little or no relationship between the South African academy and the majority of civil society. While universities were closely linked to the white middle classes, links to black sectors of society – in as much as they existed – were limited to a minuscule black middle class. Because civil society in South Africa has largely been excluded from higher education and, indeed, historically even been discouraged from considering it an option, the academy enjoys very limited social stature – by comparison to developing countries in Eastern Europe, for example, where academicians enjoy considerable status.

This factor strongly affects not only civil society expectations from higher education institutions, but also their capacity to deliver, and it means that relationships take considerable time to develop, this development being strongly influenced by personalities. In this context it can be observed that the SAU's limited success was achieved largely on the basis of the personal relationships that its founder established with individuals and organisations in the clientele, rather than on the basis of some sort of academic or moral 'weight' on behalf of the institution.

Scientific context

Comparatively and generally speaking, the South African science and technology industry leads the remains of the continent. This factor impacts on the influence that scientists and technologists can exert on national processes: their impact is considerable, in some cases even where their past is not untainted by connections to the apartheid state. Potentially, therefore, politically progressive scientific initiatives – such as science shops – would be able to make considerable impacts.

The country faces environmental problems common to all fast and newly developing nations: rapidly growing urban populations and concomitantly shrinking rural ones; rampant and unregulated industrialisation, much of it occurring in the small, medium and micro sectors (and hence more difficult to regulate); poorly developed environmental legislation and regulatory capacity; a legacy of placing short-term profits and development before long-term sustainability; etc. This milieu creates massive needs in civil society for technical and scientific support in pursuit of better living conditions – and hence major opportunities for science shop initiatives.

The emergence of the SAU was strongly informed by these contextual characteristics; most of the requests that were serviced and most of the interest that was expressed was linked to a search for support on environmental issues.

[33] This reason was communicated verbally to the SAU director by a number of the most senior executives of the two leading statal science and technology organisations.

Funding

Throughout the three years of its existence, the SAU was soliciting funds from a wide range of sources, including national and international funding agencies, philanthropic and development agencies, and university sources. Its total revenue during this time amounted to approximately R80 000 (Euro 13000), most being generated through one large project that received funding from the German government. If all other incidental costs, including salary overheads of its founder/director and occasional administrative help were included, the SAU's total three year budget would be in the vicinity of R200 000 (Euro 33 000)

While the SAU was discounted by national funding agencies for reasons stated above, the university nonetheless saw in it strategic and academic advantage. Academically, the SAU could broaden the scope of UCT activities by creating more opportunities for academic work in underdeveloped communities, thereby expanding the range of problems that could be investigated.

Strategically, the university's senior management had recognised the need for new initiatives that reflected more closely the shifted national priorities than did its various programmes that had been established during the apartheid era. UCT had had good experiences with one or two similar initiatives whose focus, however, was more tightly defined than that of the SAU. An example is the Energy and Development Research Centre (EDRC), which had established itself as one of the major revenue generators of the university through the grants it obtained from international development and philanthropic organisations. The EDRC's specific focus was on the energy industry, and it also differed from the SAU in that it was more integrated into the academic life of the institution than was the SAU: the EDRC offered a series of under- and postgraduate courses through which it recruited most of its researchers.

In the context of significant political shifts in higher education and increasing pressure to generate revenue through research (and development) initiatives, university executives were supportive of projects that would open up new communication and political channels, and new funding streams. It is likely that the support enjoyed by the SAU emanated from considerations such as these.

Conclusion

Senior university officers identified distinct strategic advantages in the SAU and extended limited support to it on this basis.

Cultural contexts seem to determine whether success or failure of science shops depends more strongly on the status and stature of academics in society, or the (personal) relationships that are established between science shop workers and their clientele.

Environmental issues present a good opportunity for the establishment of science shops, probably in developing countries in general.

The more a science shop can be integrated into the academic business of the institution, the stronger its survival chances.

6.3 Australia

6.3.1 History

Australia's first science shop existed in Canberra[34] between 1988 and 1990. It was managed by Wisenet, the Women In Science Enquiry Network, during its first 14 months after which the Centre for Continuing Education at the Australian National University took it over for the last year. Its history is well documented by Bammer *et al.* (1992).

The science shop was based on the European models, which were described in publications on the Dutch (especially Amsterdam) science shops and the French Boutiques (articles by Ades in *Nature*, Dickson in *Science*, and others by Rip and Nelkin, Zaal and Leydesdorff, and Stewart). The shop worked according to the mediation model and had the same criteria for acceptance of questions as the Dutch shops. The main difference was that the Wisenet Science Shop was not integrated into a university, something Gabriela Bammer now regrets since belonging to a university might have made the project more 'respectable' in the eyes of funding agencies (Raloff 1998).

The science shop was set up by a working group of people that had met at two conferences on science policy and feminist science. A seeding grant of 4000 dollars was obtained from the Consumer Health Forum, while the Society for Social Responsibility in Science donated 10,000 dollars (the total equalling some 10,000 Euro in 2000). A part-time co-ordinator started in February 1988, the official opening was in May 1988. Some smaller grants were obtained from two local universities and other funds.

Contacts were established with numerous community groups, and presentations were given in the media and at scientific seminars. The shop had 49 registered clients (some posed multiple questions) and 170 registered researchers in their database resulting from good co-operation with both local universities – many researchers saw the science shop as a source of ideas for student projects. Most questions related to health and environment, 40% of them came from individuals. About 25% were requests for information and 35% merely needed a referral. Not all questions could be handled since in some cases clients withdrew once they became aware of the effort that would be required of them (as in the French case), while in others volunteer researchers failed to deliver their services (for a range of reasons) or project funds could simply not be secured.

In April 1989, the shop was finally integrated (physically) into the university but simultaneously funds dried up. The Wisenet shop was effectively closed so all time could be allocated to fundraising. The extensive lobby for funding was unsuccessful; it was not easy to obtain grants from higher education/research sources for the science shop since its position was still that of an 'independent organisation'. The science shop team got exhausted and the activities were finally ended in May 1990.

6.3.2 Analysis

1. Clients

There was a clear demand for science shop services from community organisations, but also from individuals. Even with limited PR many organisations were reached. Like in the French

[34] Independently and simultaneously, the Commission for the Future endorsed science shops in Australia. With charity support, and in cooperation with the Swinburne Institue of Technology, the Swinburne Science Shop was established as a pilot project. This science shop, however, was a commercially oriented place to buy educational materials and toys, though also an information service was run and a network with schools was established.

case, many clients expected quick answers to multidisciplinary questions, which caused disappointment when this turned out to be impossible. The science shop team regrets that they did not set up an advisory board with members from social organisations in it, modelled after the Amsterdam experience. In their view, this would have increased and sustained contacts with civil society. Also, the name Wisenet Science Shop caused confusion with clients since it suggested an organisation for women only, while the word 'science' brought up images of white male physicists. Finally, the word 'shop' suggested items being sold (or at least services that were charged for).

2. Supply

Sufficient academics were interested in co-operating with the science shop. All original research was done by students in official parts of their education. Most projects that failed were the ones for which students could not be found in time. More capacity at the science shop might have increased the PR visibility and generated follow-up activities to increase the number of students involved in the initiative. Research efforts were constrained by time and disciplinary limitations; changing the latter would especially require new rules in the higher education institutes.

3. Hosts

The Wisenet team considered that given the political climate at that time (e.g., cost-cutting in universities) it was best to create a structure independent of the university or government restrictions, because that way a flexible and creative approach to community service could have been created. As mentioned, the consequence was that funding options were limited to agencies that funded community groups; these were suffering from financial shortages themselves.

4. Science Shop staff

The organisation depended a lot on volunteers, with only a part-time paid co-ordinator. The dilemma between doing actual projects and allocating much time to fundraising emerged as well. In the end, staff members had no more energy to accomplish their mission.

In the late 1990s, a new science shop named 'Shopfront' emerged at Sydney's Technical University (UTS). This is operating exactly like science shops at European technical universities[35]. Shopfront's core program centres on community-initiated projects undertaken by UTS students supervised by academic staff, and the organisation provides support for these projects in their development as well as through project management, ethics workshops, troubleshooting and exit interviews. The program is based on the Dutch science shop model utilising the skills of the university to meet community need. Shopfront is a university-wide program with access to all nine faculties, and over 130 projects have been completed since its inception.

The inspiration for the Shopfront came from a group of academics that included historians, anthropologists and sociologists. This group had been working separately on developing community research and advocacy centres within the university. They combined their ideas and formed a steering committee which successfully applied for funding to the Federal Government to set up a Shopfront. After two years the Shopfront had established a strong track-record and successfully lobbied the university for three years' funding and ongoing support, subject to a review in 2000.

[35] http://www.shopfront.uts.edu.au/, and personal information from Shopfront Director O'Loughlin, 2001.

6.3.3 Discussion

Below are several factors that contributed to the success of the current Shopfront programme:

1. At the Shopfront contributions to community service/projects are an integral component of existing academic activities and not additional to them. The projects are linked to coursework for which students gain subject credits, and all work is supervised by an academic. This approach allows the underlying pedagogical principles of the university to remain intact.

2. The multi-disciplinary nature of the Shopfront, arising through its access to all disciplines and faculties across the university, provides opportunities for innovative, multi-disciplinary projects which is a priority at the UTS.

3. The financial support and encouragement of senior staff within the university.

Shopfront is very excited about the development of the international science shop network. As the science shop concept is very new in the Australian context, they often look to overseas models for inspiration. The Shopfront is currently working with the University of Queensland in developing a Australian national consortium of university/community centres.

Shopfront's success so far seems to prove some of the statements made by Bammer: The Wisenet science shop was the right idea at the wrong time, and integrating a science shop into a university increases its chances for success. The latter gives a steady flow of 'supply' and financial security, including sufficient paid staff.

6.4 USA

The 'Science for Citizens' movement evolved in the 1970s from complaints that science had become excessively elitist and out of touch with social problems (Dickson 1984). With NSF support, within the Science for Citizens program, an attempt was made to provide citizens with the information required to participate in the democratic decision making through the 'Public Service Science Residencies' and 'Internships'. Through these mechanisms individual scientists and students could help citizen organisations. Controversy developed over how far the government should go to finance its own opposition. The program was terminated in 1981, in favour of basic scientific research (Irwin 1995).

As described in the study by Gnaiger and Martin (2001). that forms part of the SCIPAS project, Community Based Research (CBR) centres in the USA differ from science shops in some important aspects. In general, they have a larger participation of 'clients' in the research. Community representation in policy boards of the centres is also much larger than in the Dutch science shop model. In many cases, grassroots organisations have been very important in starting CBR centres. This is different to the European situation where scientists (science shop supporters and staff to-be) and students played a larger role. However, there are also US cases of science shops modelled after the Dutch example.

We briefly describe three cases thought to be representative of the way a community-based research centre is started in the USA.

Nuclear Risk Management Project for Native Communities (NRMPNC)

(based on Sclove *et al.* 1998, p. 15-20 and additional information obtained from Chopyak, Loka Institute, 2001)

In 1993, native communities of the Western Shoshone and Southern Paiute turned for help to the Childhood Cancer Research Institute (CCRI) based in Worcester, Massachusetts. They live downwind from the nuclear testing sites in Nevada and suffered adverse health effects for which government officials denied responsibility. CCRI collaborated with Clark University and several tribal groups to set up community-based infrastructure to develop and disseminate accessible information on nuclear contamination health hazards, and to create a community-based hazards management plan.

The NRMPMC was a collaboration instead of a top-down approach. Funds were also shared equally (which is said to be the key of the success of this project). The new – and sustainable – infrastructure shared scientific information and local knowledge, both of which were much needed to assess radiation exposure. Community advisory committees were set up to oversee planning and implementation of clean-up programs.

The CCRI itself was developed out of the work of Alice Stewart, MD, who published widely on the effects of low-dose radiation (a controversial subject in science and politics). Stewart and Dianne Quigley (the first Director of CCRI) were able to start CCRI with a donation of 100,000 USD by David Kleeman. This guaranteed CCRI's infrastructure for 2 years. Currently, many charities donate to CCRI and its projects. The strategical alliance with Clark University works well (Quigley is a research fellow at this University); especially with the Centre for Technology, Environment and Development. Through Clark University, CCRI could subcontract in federal research funds. Most of all, Clark University provides professional support, colleagues and outreach to the scientific community. This is very important for an institute with a staff of two. By setting up sustainable infrastructures for community-based research CCRI's influence is larger than this number suggests.

Neighbourhood Planning for Community Revitalisation (NPCR), Minneapolis, MN

(based on Johnston and Scammel 1997)

The NPCR was founded in October 1993 to facilitate community-based research projects in the neighbourhoods of Minneapolis. It is governed by representatives of local educational institutions, municipalities and community organisations. NPCR's purpose is to provide research assistance tailored to the neighbourhood's needs, and also provide valuable learning experiences to faculty and students by incorporating them in community research projects. The NPCR helps citizens to take action to improve their living conditions ('demand' exists), understand complex issues and obtaining information.

NPCR was started by the Centre for Urban and Regional Affairs at the University of Minnesota, in response to a challenge by the City of Minneapolis (in 1990) to develop a 20 year plan for the city's newly established Neighbourhood Revitalisation Project. A graduate student, together with community representatives, made an inventory of subjects and programs at the various higher education institutes in which students could participate in community based research (such as internship and work-learn programs). As a result, Metropolitan State University, MacAlester College, Hamline University, the University of St. Thomas and others started co-operating in the NPCR. The office of NPCR is at Minnesota University. 'Supply' (students from a wide range of disciplines, who are paid internship money through their own schools) and 'hosts' had been arranged. The office 'staff' consists of a project director and an administrative associate.

NPCR obtains funding from the US Department of Higher Education's Urban Community Service Program. The expansion to St. Paul's neighbourhood in 1996 was financed from St. Paul's Local Initiatives Support Corporation and other foundations. All consortium members offer in-kind support to NPCR.

CURL/PRAG, Chicago, IL

(Based on Sclove *et al.* 1998, p. 12-15, Mayfield *et al.* 1999, and personal information from Phillip Nyden, director of PRAG, January and February 2001).

Chicago's Policy Research Action Group (PRAG) is a collaborative network that provides research assistance, and supports research partnerships between academics and grassroots organisations in Chicago. A working group with representatives from universities, community-based organisations, labour unions and government agencies managed to obtain funding from the MacArthur Foundation in the late 80s. A conference was held, attended not only by academics but also by community organisations who spoke on labour and housing issues; the proceedings of the conference were published. In working together on real-life neighbourhood problems stereotypes were slowly overcome and trust was built. The network now consists of 200 persons from 4 universities and 15 community organisations. Community organisation in Chicago is quite strong.

PRAG has relatively few staff, with a faculty member (from Loyola University) acting as director (20% time), in addition to which there are two part-time project co-ordinators and a secretary.

Initial successes allowed PRAG to obtain more funds. The total funding received from the MacArthur Foundation and the Department of Education now mounts to over 4 million USD. Other funders are the Department of Housing and Urban Development and three universities. PRAG has supported over 150 projects so far.

Loyola University of Chicago has served as fiscal agent to PRAG since the beginning. Director Nyden was chairman of the Sociology and Anthropology Department at that time, so this arrangement worked well. The success of PRAG convinced Loyola to establish an additional university-community collaborative unit within the university that would work even more closely with linking Loyola faculty, students, and educational/research programs with community organisations. CURL, the Centre for Urban Research and Learning, was started when it received a grant of 600,000 USD for its first three year's operating expenses and an endowment of 900,000 USD to support faculty and student fellowships. What is significant about the endowment is that it does make the Centre more permanent. Initially this meant that the University had the responsibility to co-ordinate and facilitate the fellowships regardless of additional funding for staffing. However, since CURL's creation in 1996, the initial endowment has grown (now almost 2,000,000 USD) and it has received another 2,500,000 USD endowment challenge grant (February 2001). The University is expected to raise an additional 2,500,000 USD over the next five years. This additional 5,000,000 USD endowment will provide the income to support the basic operating expenses of CURL, making it permanent. To date, CURL has completed 50 projects and it currently employs 9 full-time staff, 25 graduate fellows and 4 community fellows.

An endowment is not typical for this kind of centre, even in the USA. However, endowments are certainly the way many more traditional academic centres are supported in the USA. This is in contrast to European universities where public funding has a much larger role to play and less private foundation money is available. The US government has historically funded social welfare programs (and the research to establish and evaluate those programs) at much lower levels than most western European countries have, and the funds available from philanthropic sources generally do not compensate for this lack of federal funding. Nevertheless, CURL and PRAG have been very successful in securing support from foundations: in total they raised over 17 million USD to support their projects in the past 12 years. The university now assists the projects in securing endowment grants and has been open to how this might lead to new modes of ways of education and research.

It would appear that in the USA the role of charitable organisations is very important when starting a science shop.

6.5 Canada

The recently established Community-University Research Alliances (CURAs) are based on the Dutch science shop example (Holden 1998). The Dutch situation was studied by a team from the Canadian Social Sciences and Humanities Federation who visited the Dutch national science shop meeting in 1996; their work was facilitated by the fact that one member of the team had mastered the Dutch language. Their reports (Warme-Van Gent 1996, Roman 1996) led the Social Sciences and Humanities Research Council (SSHRC) of Canada to start the CURA project. This project was set up large-scale, since this was taken to be necessary to acquire enough critical mass for this new methodology to establish itself nation-wide. There was no rationale for starting small-scale, since the system had been tested extensively in The Netherlands, even though the CURA programme was adapted to the Canadian situation. For the SSHRC it was a novelty to start subsidising research infrastructure instead of projects. Also, it was the first time they subsidised non-university based researchers.

The SSHRC is now funding collaboration in areas of mutual interest to community groups and universities[36]; the first tranche of 22 grants totalled 13.6 million dollars for the period 2000-2003 (approx. 8.5 million Euro). Conversations with other government agencies have created interest there as well (personal communication, P. Levesque of SSHRC, 2000). Even though the success of the CURAs has yet to be established, the facts so far show what an innovative research council is capable of.

6.6 South - Korea

In South Korea, the first science shop was established at Chonbuk National University[37] in 1998, and it is now successfully operating along the Dutch model.

At least two other efforts have been made to start science shops; at Kookmin University, Seoul[38] in 1997 and at Seoul National University[39] in 1998. The Kookmin initiative stopped at an early stage for unknown reasons. The initiative at Seoul National University was driven by two graduate students who propagated the idea of a ‘public science’, one part of which would be the science shop. They did not succeed in convincing university and the initiative was terminated when they went for military service.

Korea not only experienced ‘compressed modernisation’, but the Korean civil war in 1950 as well. It still has a weak civil society (not ‘social movement’); society can be characterised by individualism and hard-line capitalism. Ideas of social responsibility are not common. This cultural environment is also reflected in the internal organisation and operation of universities[40], and may explain the slow development of science shop initiatives.

Currently, a science shop is under construction in Daejun[41], where national research laboratories are densely concentrated. This makes the initiative different from previous ones

[36] Levesque, P., Social Sciences and Humanities Research Council, Ottawa (personal communications)
[37] http://sci-shop.chonbuk.ac.kr/
[38] Kim, H., Kookmin University, personal communication, 1997
[39] Kim, B., Centre for Democracy in Science and Technology, Seoul, e-mail 20 Nov 2000
[40] idem
[41] idem

since it is located in a significantly different environment of scientific supply and potential hosts, and – importantly – is receiving support from KSTU (Korean Scientists and Technician Union of the National Laboratories), in addition to community groups and a local assembly alliance.

6.7 Malaysia

The science shop idea came to Malaysia in the mid 1990s and the University of Malaysia at Sabah took the opportunity to become the first university in Malaysia to establish a science shop, whose focus is on environmental issues. The Northern Borneo Science Shop (NBSS) is a part of the Institute for Tropical Biology and Conservation, and it is especially active in the field of nature conservation[42]. Initial contacts have been made with Dutch counterparts. A planned working visit in March 2001 had to be cancelled due to lack of funding.

[42] http://www.geocities.com/science_shop/

7 General discussion and conclusions

7.1 General

There is no single ‘best-way’ to start a science shop; local circumstances play a large role and must inform the way in which a shop is to be established. This accords with a conclusion drawn by Valenduc and Vendramin (1995), that blindly transferring ‘best-practices’ in shaping the relation between science and society from one country to another is a dangerous pitfall. Nonetheless, we will attempt some generalisations in the next section.

The extended Stewart and Kahn model outlined in section 3, above, offers a structured way to consider and evaluate the potential for a science shop in any new situation. This model describes four important (f)actors or agents who between them determine the success or failure of a science shop, the relations between them defining the characteristics of the shop. The four agents are:

1. Clients (demand)[43]
2. Scientists (supply)
3. Institutions (hosts)
4. Science Shop staff (executive level, both individual and collective)

If the support of any of these is and remains zero, the initiative is bound to fail.

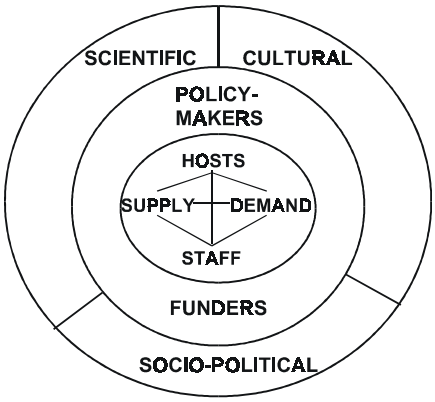

Figure 1. Science Shop in its surroundings.

To Stewart and Kahn’s model, we add the role of funders and policymakers. All agents will have their own networks (or lack thereof), which can influence their behaviour, and so the ‘network' factor can be thought of as the matrix embedding the above agents. Funders and policymakers may influence the development of science shops either through regulation or subvention, directed at any of the agents involved.

Clearly, the four agents listed above exist within specific historic socio-political, cultural and scientific environments or contexts. To prepare the start up of a new science shop, one should analyse the position of all four essential actors. From the cases outlined above, different approaches can be copied and/or combined to get the best fit in new circumstances. It is important to study the different operational options for science shops as well. These are described in SCIPAS-report 1 (Gnaiger and Martin 2001).

7.2 Conclusions from the cases

When we compare the case studies in this report, some interesting analogies can be seen, despite the differences. In a way, the same factors that proved fertile soil for the Dutch

[43] Since ‘clients' also have a lot to offer (local knowledge, new research themes), the terms ‘demand' and ‘supply' are in fact too absolute. In practice, there is a two-way flow of knowledge.

science shops in the 1970s are seen in Romania in the 1990s. There are important environmental problems which come impact people's daily lives, the NGO sector is being established, and higher education is reforming to integrate more problem-based learning. Citizens are beginning to voice their opinions, democracy is being strengthened – also at universities. Of course, there is an important difference in the state of the economy: The Netherlands was already comparatively wealthy in the 1970s.

Some general conclusions and recommendations can be made with respect to involving the four essential actors, and the role of funders and policymakers in starting or supporting science shops. This analysis will reveal factors that are closely linked to success and failure. At the end of the chapter we will focus on the potential role of an international science shop network in supporting new science shops.

7.2.1 Clients

Since science shops operate in a demand-driven way, 'clients' are of course necessary. The basic premise is that there is a (maybe latent) demand from society for scientific support. However, sometimes this demand does not match with potential supply.

1. Potential clients may have an unrealistic expectation (or awareness) of science. For example, in the French case most citizens had very high expectations of science. This image of instant and tailor-made magic bullets was cultivated by media and museums. When, in practice, finding scientific answers to multi-disciplinary problems turned out to be difficult (or at least to take more time than expected), these clients turned away from the science shop.
   Another example, from the Dutch case, involves a group of disabled persons who approached a science shop to ask questions about their healthcare (relating to organisation, finance, etc.): the same group never thought of asking a question to a technical science shop (for adapted technology). They were unaware of the potential of technology to improve their situation.
   Both situations mean that PR and working on a realistic public awareness of science is required. Clients can be actively solicited and made aware of the potential value of scientific support for their case; depending on place and time this can take more or less effort and time.
2. Civil society can be more or less organised. Science shops can support civil society to organise by linking client groups through the science shop's network with fellow science shops and client organisations (e.g., referral to patient organisations, larger NGOs). It is even possible to actively train people to start NGOs (e.g., as done in Romania).
3. As long as there are no civil groups asking questions, pilot projects can start from individual questions or even from societal/environmental problems as conceived by the science shop staff/scientists using a pro-active approach. Also, pilot projects can be taken up that are of interest for purely educational reasons. Results from the pilots can be used to demonstrate the potential value of science shop projects to potential science shop clients. These demonstration projects have been done in France, Romania and South Africa for instance.
4. Clients can be represented in Science Shop Advisory Boards. Especially during start-up this can help convince other actors of the need for science shop activities.
5. In The Netherlands, clients professionalised over the years which led to more complex research questions. This required a continuous professionalisation of the science shops (with regards to their supply of knowledge and demands on science shop staff). Simultaneously, this professionalisation should take place without losing capacity to help the group of non-established clients.

7.3.2 Supply

For a science shop it is crucial to have a supply-base of knowledge and research capacity to answer to questions from civil groups. If it lacks this base it will not succeed. E.g., the only science shop in The Netherlands that was not linked to a University (in the Province of Zeeland) could not survive on it's own and had its activities transferred to the Science Shop at Erasmus University Rotterdam. Also, the WISENET science shop in Australia suffered from this lack of research capacity.

As long as there is no funding to start a separate research institution, it is important to try and integrate science shop activity in existing research and education activities. This usually means a change in research and education topics and methodologies, and not an increase in required funding per se (i.e. in education, students should learn to do research, and academic staff should supervise them in this anyway, no matter whether the subject of research comes from a textbook or from society). Also, science shops are meant to open all existing research and knowledge to society instead of setting up dedicated research institutes that can of course never cover all scientific efforts.

From the case studies we learn that:

1. Supply increases when students are allowed to do science shop projects as part of their curricula (i.e. for credit points). This is the basis of e.g. the Dutch science shop system. In a new situation, science shop projects may be included in existing courses, practical periods or in diploma/PhD projects rather swiftly. Starting new, dedicated courses or projects may take more time (e.g. for official recognition by educational departments). It requires that project-education or problem-based learning are considered useful in student's education. In a strict mono-disciplinary, academic setting it is very difficult to integrate students in science shop projects.
2. Students can be attracted as volunteers as well. E.g., in Romania the multi-disciplinarity of the projects, and the applied research attract many students. Also the international contacts are appealing to them. In The Netherlands, during start-up of the science shops, also many students volunteered. When students have too little time next to their study-requirements this reservoir of research capacity is not large (e.g. as was the case in England in the 1980s in comparison to The Netherlands, but also as currently in Dutch situation).
3. Researchers are sometimes willing to share their knowledge without any strong social motivation; they are quite willing to spend a few hours to apply their expertise to help solve a problem. Other researchers may be more strongly socially motivated, but for them it is not always possible to spend more time on science shop projects. Also here one should try to integrate social research questions in existing research themes and programs, unless there are (matching) funds available.
   The potential for science shop's incorporation in regular research activities increases when science shop work is valued in any other way as a part of the regular scientific work. I.e., academic staff can be rewarded for a few hours per week to supervise science shop projects, or to do research in these projects themselves (as part of their job-description or teaching assignment).
4. Disciplinary constraints can limit science shop projects. For scientists and students, it should be possible (practically and officially) to work in multidisciplinary settings.
5. Commercialisation forms a threat to the supply of knowledge that can be used for science shop work. The segment of society served by science shops is per definition the non-profit, non-commercial sector. In a situation in which every hour of research needs to be paid, science shop projects have little chance. Also, when companies can pay students to write a diploma project on the company's research request there are less students that opt for a science shop project.

7.2.4 Hosts

There are different options for organising a science shop; i.e. by affiliation with a university or existing NGO, or as an independent NGO.

1. Universities can be good hosts for science shops, since they have some 'standing' as being independent, objective reservoirs of knowledge, and they offer a reservoir of scientists and students. Money is usually available at universities if science shop work can be to some extend included in regular activities. The allocation model usually needs to be changed, however. Additional funding is harder to get because of the fact that scientific funds often are limited to projects (not general running costs) and because projects are usually assessed on scientific terms only. Budget cuts and commercialisation at Universities are big threats to science shops.
   For starting science shop work at universities, multi-disciplinarity and problem-based learning should not be foreign to the host-university (unless they are introduced simultaneously).
   Locating a science shop at the central level, or de-central, at the Faculty or Department level, does not affect its chances of success. This choice depends purely on local circumstances.
   In The Netherlands, the introduction of democracy at Universities made the introduction of science shops easier.
2. NGOs can be good hosts when universities do not or cannot co-operate or are not trusted by civil organisations. They have access to a different type of funding agencies, which sometimes have more and sometimes have less money available. An (existing) NGO can also be an incubator to demonstrate science shop projects, before disseminating the method to other hosts. It is more difficult for an NGO to work with students or to get accepted by scientists. An NGO form is more independent, however (as long as it obtains finance).

7.2.5 Science Shop Staff

Science shop staff members should have many communicative skills and an overview on a scientific field, next to experience in or affinity with working with non-scientists/community groups and with scientists/researchers (see also SCIPAS Report 3, De Bok 2001).

1. A combination of two people with complementary skills works well (Romania).
2. Often, science shop staff is forced to choose between doing (pilot) projects or spend much effort on fund raising. Having no time to do both at once can cause the initiative to fail. This is what happened in France and Australia in the 1980s, and to a lesser extent in the Czech Republic as well.
3. Science shops are vulnerable for staff changes since they are small organisations. Having multiple staff members, written manuals and a good network decreases the risks associated with staff changes.
4. When the administrative part of science shop co-ordination is not seen as scientific work it is difficult for academic staff to help start a science shop on the executive level. Staff is however able to start science shop projects as a personal research project (e.g. as in South Africa, or in the USA), and later try to establish a science shop office.
5. It is important to document the work and successes of the science shop, both on social impact and on scientific achievements. In practice, there can be a lack of time to do so; on the long run this can cause problems. PR is generally very important.

7.2.6 Funding/policy making

Larger funding makes the introduction of science shops easier of course, especially in countries with lesser economic power. However, also lifting some non financial barriers by policy makers can be helpful.

1. If funding is made available to allow the *start-up* of science shops, this can facilitate pilot projects. The results of these projects can be used to convince other actors of the relevance of this type of research and pave the way for its incorporation in regular research and education activities.
2. Seed funding should be for a sufficient length of time, depending on the tasks of co-ordinating science shop staff (i.e. how many other actors still need to be convinced, contacted, solicited et cetera). A period of 3 to 5 years seems reasonable.
   In France, finance was given over a short period of time in a decreasing amount to a growing number of science shops, which was the basis of failure of the initiative. Instead of co-operation, competition was created. The lack of funding clearly killed many science shops over the years, in many countries.
   Next to regular university or government funds, charity can be a source of funding as well. This may require some creative organisational rearrangements to become eligible for these funds. Charity is a common source of funding in the USA.
3. When a science shop is organised as independent NGO structural funding is required. This is dependent on national funding arrangements; in the end it does not matter much whether public money is allocated to a science shop through universities or directly from a government agency. Charity funds are another suitable option here.
4. Relieving bureaucratic or academic constraints is helpful for new initiatives. When Universities host a science shop they should be able (i.e. allowed, or may be even forced as was the case in The Netherlands in the early 80s) to use part of their budget for it. Scientists working for a science shop should be rewarded for this work, either by it being in their job description, or financially, or as part of their teaching assignment.
   This would balance the scales with commercial scientific services to other sectors of the society. It is important to stress that 'society' covers the whole range of individuals, non-profits, SMEs through industry. Otherwise, in times of budget cuts, service to society can become defined as service to those who can afford it.
5. It is important to support problem-based learning and multi-disciplinary research to enable valuable knowledge transfer to society.

7.2.7 Network

The role of an international science shop network in starting science shops can already be classified as important. A national initiative seems to have a larger success rate than a single (local) initiative, though there are also counter-indications to this conclusion. In a national network, operational options are shared swiftly. The same can be done in an international network. I.e., in the French case the international contacts were not common, which let the French science shops to be unaware of various operational options (such as working with students in the research).

From the cases presented in this chapter, some conclusions can be drawn with regards to the role of an international network of science shops:
1. Information transfer can work well through working visits and/or workshops. Those wanting to start science shops have often visited The Netherlands. The Dutch science shops received representatives from e.g. Israel and Canada recently; in both countries there is now an active approach to adapt the Dutch science shop system to national circumstances. A network can facilitate these exchanges.
2. The network can facilitate a more active coaching and information transfer. This works if sufficient time can be made available by the coach, and the coaching science shop resembles the new starting science shop (the Czech Republic vs. Romania). The network can also improve structural co-operation in projects, and shared studies and programs. Obviously, sufficient funding for the co-operation should be available.
   The experiment in the Czech Republic had a de-central Dutch science shop trying to start a joint-central office for three Czech universities, which caused all kinds of unforeseen

problems. In Romania, the four new science shops were modelled after their Dutch counterparts almost exactly, which made support and mutual understanding easier.
In the coaching contacts, the coaching science shop should preferably have knowledge of the language and culture in the coached country. In the Czech project, this knowledge was absent, whereas in the more successful Romanian project it was present.

3. The network can facilitate an international (peer-reviewed) science shop journal, which would make it easier for scientists to publish their work and fulfil their academic publishing requirements while doing science shop projects.
4. Articles in scientific magazines can create a lot of interest in science shops; in a network cases can be collected and discussed, and articles can be written.

8 Recommendations

Some policy recommendations can be derived from the work presented in this report. We will focus these on policies regarding the facilitation of the successful start up of new science shops - other policy recommendations are made in the other reports from the SCIPAS-project.

To quote Dr. Rainer Gerold, Director: Science and Society, Research Directorate General of the European Commission (Gerold 2001): “Every science - and every society - needs a science shop”. Now, how do we achieve this at the European level?

From the cases presented here it is clear that it takes dedicated people to start a science shop, those who are sincere in wishing to bring together science and society in novel and progressive ways. This type of person is at the heart of things and is who creates the trust of citizens in science. Next, science shops operate on a small-scale, regional level, which makes them both accessible and flexible. To successfully start such initiatives, mutual co-operation is highly beneficial. Also, the bureaucracy involved for the facilitation of the new initiatives should be the bare minimum.

We see three possible actions to increase the regional dissemination of science shops on the European level:

1. A European network would ease the creation of new science shops, and would also benefit existing ones by facilitating constant renewal. For new shops, an existing network would mean access to information (database, magazine), protocols, case studies, training and personal support. Support for the emergence of an international (thematic) network of science shops is therefore recommended.
2. One of the activities connected to such a network would be a coaching program for new science shops. Project/program funds could be made available for a group of applicants consisting of at least one existing science shop and one new initiative - though it is possible for one or two existing science shops to successfully help start a whole new regional network of science shops elsewhere, as was seen in the Dutch-Romanian case. These coaching projects would consist of financial support to the new science shop (salaries, operating costs), to the coach (salary, travel) and to joint (student) projects and working visits.
3. After the initial stage, in which a science shop has been set up, it is beneficial for them to be able to do joint projects with older, established science shops. On the European level, one could think of a call for research projects of scientists with (support of) community organisations. As indicated above, the bureaucracy involved in applying for such a fund would have to be minimal. Also, to make this work in practice, finance should be possible up to 100% of requirements given the very limited availability of matching funds with science shops and many community groups. Next to specific projects, these co-operations could focus on general themes (e.g., health and environment, minority issues) in the form of more substantial research programmes - which would then resemble the Canadian Community-University Research Alliances (CURAs).

Next to the actions above, the influence of moral support from the European Commission to science shops should not be neglected. It is of great strategic value to strengthening the position of science shops within their host-institutes. Moreover, the European Commission's funding of the SCIPAS project has not only improved the position of the SCIPAS consortium members, but also that of their regional partners.

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Appendix 1 Checklists for starting a Science Shop at University

(based on this report and practical advice in Jørgensen M.S. 1999, 'Science Shops. An introduction to the concept of Science Shops and to the Science Shop at The Technical University of Denmark')

Before starting a science shop, it is important to consider why you want to start the science shop at the university (or any other host). Which needs do you expect the science shop to fulfil? Which benefits do you expect whom to get from the science shop?
The initiative for science shops has sometimes come from students and sometimes from the scientific personnel at the university (or school or faculty). It is a good strategy to develop the proposal for a science shop as a joint initiative from students and scientists. It is also a good idea to involve possible users of a science shop to discuss the possible needs for knowledge that could be covered by a science shop at the university. Students, scientific and maybe administrative personnel from the university and some possible user groups could form a planing group to be responsible for the preparation of an application. They can form the basis for a Board of Advice. It's beneficiary to have someone from the financial department involved as well (E. Martin, Science Shop for Northern Ireland, personal communication, 2001).

An application for a Science Shop to a university (though for any other host a like list could be made) should at least touch the following topics:

1 Why a science shop at this **host** university? What are the potential benefits for the university and for the society (region)? Usually, the University's 'mission statement' offers possibilities to base the proposal on. Check what other contacts the university (already) has with society and see whether there is a missing link (cf. table 2, this report).
2 What is the **demand** for scientific support:
   - Who are potential user groups?
   - What is their need for knowledge?
3 Is there a potential **supply** of scientific support:
   - How can a science shop and students' project work fit into the curricula of the university ?
   - How can the scientific personnel be involved in the science shop work: Supervisors? Working themselves with requests?
4 **Feasibility**: What do you require from **funders**, **policymakers** and how will the science shop operate (**staff**ing)?
   - Describe examples from other shops
   - Describe the activities of the proposed shop (also with regards to the 'missing links' in university-society relations)
   - Affiliation of the science shop to the university: Organisation and management.
   - Personnel in the science shop
   - Budget and financing: University funds? National funds?

Points to consider with regards to the above:
1 It is important to discuss the potential benefits from a science shop and stress that a science shop not only helps society in a one-way direction. It is also giving something to the university. These four types of benefits should be discussed:
   - Developing the relations between the university and the society; PR.
   - Giving the students experiences with project work and co-operation with user groups outside the university.

- Renewing research and education at the university based on the user groups' knowledge needs and developed through the project work (problem-based learning and multi-disciplinary research).
- Unlocking practical information (users experience) for use in science

2 It is an important part of the planning to get in dialogue with the possible users of a science shop and ask for requests for research and advice. Such proposals illustrate the needs to the planning group and can support the application by showing that there actually is a need for research and advice among lay people, NGOs and others. One or two pilot projects might be carried out as part of the planning work in order to get first hand experience at the university with co-operation with user groups. This can be done before establishing a formal science shop.

3 To discover potential supply:
- Describe options for students to participate in science shop projects. This can be done as volunteer (do students have time for that? is it common to do unpaid work? are they interested in science shop projects?). Or it can be done for course credit (make an inventory of existing courses, practical periods, internship periods, diploma works and like that would allow this - maybe survey some professors for the possibilities for diploma projects with them on science shop cases). Students could also be paid as assistants; is there money for this? is it common to have students working as assistant on projects like these?
  What could be changed in the curriculum to allow (more) space for science shop projects? (Remember that official changes in study programs take time. If there's any optional periods in the program, it may be easy to introduce the possibility to do a science shop project there).
- Does staff have the time to work on projects? Part of their normal tasks are supervision and teaching; the more science shop activities can be combined with this the easier it is for them. Can they work as researcher on science shop projects? If not, what options are there to improve this situation? Consider changed allocation of time (university policy change?), funds to be used, research groups that work on topics closely related to social questions, et cetera (so, supply taken both quantitatively -working hours- and qualitatively -matching needs).
  Remember, the closer the science shop activities can be integrated in normal work at university the easier it gets to introduce a science shop. Students should be learning to do research and staff should supervise them and do some own research anyway, no matter whether the subject comes from inside or outside university.

4 The existing science shops perform a number of different activities. They all work with the requests from the user groups and some of them also work with renewing activities at the university. Please take a look at different operational options that are used by other science shops (as reported by Gnaiger and Martin 2001), and make your own best combination.
  The need and the possibilities for these different activities that could be considered during the planning of a science shop:
- Short term advice: Answering by the science shop, using the scientific personnel at the university, referring to external sources;
- Sudent project work;
- Advisory groups for meeting with user groups on ongoing projects;
- Research projects;
- Developing new areas for education and research: Empirical fields, theories and methods for co-operation with user groups.

  Science shops can perform a number of other tasks as well (internship co-ordination, course organisation, trainings to the non-profit sector, commercial knowledge transfer, et

cetera) which may help to make room or get acceptance for its core-business.
An important part of the planning is to prepare the budget for the science shop. Since the activities of the science shop are free of financial barriers, the resources have to come from the university or other funds. Various science shops have found different ways of financing themselves; take some time to look these examples.

5 Some important resources needed for a science shop are:
- Personnel: Student employees, scientific personnel, and secretary. The students are very important because they are close to the other students and the different departments. Salary to the personnel, including allocation of working hours of permanent personnel.
- Volunteers: Networking with scientific personnel and students. There is a need for developing networking at the universities within the topics the user groups are coming up with.
- Equipment, including computers, and resources for copying, postage etc.
- Rooms and other facilities.

It depends on the university which part of these costs are 'hidden' in overheads paid by university directly. Some universities charge everything to their departments, others pay telephone, housing et cetera from a lump sum.

Finally, try to make a list of allies (and maybe enemies). Allies can be taken up in a Board of Advice. People and departments in PR, other university contacts with society, social sciences, science and society studies, et cetera, will not be irrelevant to science shop work one way or the other.

Appendix 2 Tips for supporting starters

For the support of a new science shop by an already existing science shop, some recommendations can be given. These are merely based on the experiences gained in the co-operation between the Chemistry Shop Utrecht and the Brno Science Shop-to-be, and the co-operation between the Chemistry and Biology Shops Groningen and the four Romanian Science Shops.

The overall scheme for introducing a new science shop can be divided in four phases:
1. Choice of a city/partner;
2. Theoretical introduction (consulting local universities, staff, NGOs; organising a seminar);
3. *. Demonstration project(s) to show the potential of a science shop project and introduce methods of project education (format: international student's project under staff supervision and NGO support);
4. *. Establishing a science shop (office, infrastructure, funding, selecting advisory board, appointing co-ordinators).

* In Romania, the establishment of a formal structure preceded the demonstration projects. This provisional establishment was possible through the funds that had been acquired for this project.

There were some differences between the Romania and 'Brno' project which in our view added to the Romania project being currently more successful:
- A Dutch team member had extensive knowledge of Romania (including language skills and a relevant network inside Romania);
- In Romania, contacts were also made at higher university level (Rectors, Deans), and bi-lateral agreements were signed with all four universities;
- The Romania project obtained more funds;
- In Romania science shops were set up at one Faculty or University, so they did not face the practical problems of a shared office for several universities. The new science shop should more or less resemble the coaching science shop;
- In Romania, science shops started up at more universities which allowed the establishment of a regional network;
- Since this initiative included a small number of universities and relatively a short time for the consolidation of Romanian science shops, the support of both Romanian Ministry of Education and also of the international community (network, Matra, EU funding) is essential for the existent shops and for the creation of new ones;
- Training of science shop staff was made by the Dutch team 'in place' and by foreign science shop staff visiting different science shops in The Netherlands (with the occasion of international projects). Science shops could benefit of the future EU network by means of more diverse training programs, including those in community based research;
- For the Dutch science shops, Matra subvention is rather well suited for this type of project. Most Central European countries are eligible for this; but also, e.g., Turkey is Matra-eligible from 2001. The EU also has pre-accession funds aimed at supporting democracy in CEE countries.

The method to choose a city or university for co-operation worked well in both cases (based on existing twinning relations, personal contacts, university co-operations), as well as the reconnaissance trip to discuss the science shop project with all agents involved.

Appendix 3 Tips for long-term survival

Things change over time. Therefore, this checklist is relatively simple.
For long-term survival, one should constantly be aware of these changes:

- What has changed or will be changing concerning your demand and supply?
  - Commercialisation?
  - Educational reforms?
  - Professionalisation of civil organisations?
  - Emerging research themes?
- Is your staffing still adequate?
- What new funding or policy developments are there?
- Are there any new tasks that you should or could perform?
  - Education in regular courses?
  - Trainings for civil society?
  - Internships?
  - Research policy studies?
- Is your PR good enough, are you still visible?
- Describe your social and scientific successes where and whenever you can.

SCIPAS reports

SCIPAS report 1:
Science Shops: Operational options
Andrea Gnaiger & Eileen Martin
FBI, Innsbruck, Austria & Science Shop Queen's University Belfast, UK

SCIPAS report 2:
Success and failure in starting Science Shops
Henk Mulder, Thomas Auf der Heyde, Ronen Goffer & Carmen Teodosiu
Chemistry Shop, University of Groningen. Groningen, the Netherlands

SCIPAS report 3:
Training programmes for science shops
Caspar de Bok
Science Shop for Biology, Utrecht University, Utrecht, the Netherlands

SCIPAS report 4:
The development of an international science shop magazine
Norbert Steinhaus
Wissenschaftsladen Bonn,. Bonn, Germany

SCIPAS report 5:
Development of a public Internet database of science shops
Jill Chopyak
The Loka Institute, Amherst MA, USA

SCIPAS report 6:
The impact of science shops on university curricula and research
Merete Hende and Michael Søgaard Jørgensen
Science Shop Technical University of Denmark. Lyngby, Denmark

SCIPAS report 7:
Living Knowledge: the network
Accomplishments and further opportunities for developing an international network of science shops.
Maaike Lürsen & Dick Sclove
Science Shop for Biology, Utrecht University, Utrecht, the Netherlands

SCIPAS report 8:
Living Knowledge: conference proceedings 2001
Maaike Lürsen & Caspar de Bok (eds.)
Science Shop for Biology, Utrecht University, Utrecht, the Netherlands

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This report is the output of the project called SCIPAS (Study and Conference on Improving Public Access to Science through Science Shops) which has been awarded financial support by the European Commission through the contract HPV1-CT-1999-00001 under the 5th Framework Programme of the European Community for Research, Technological Development and Demonstration Activities (1998 to 2002), and its specific programme "Improving the Human Research Potential and the Socio-Economic Knowledge Base" ("Strategic Analysis of Specific Political Issues").