Platform of Local Authorities and Communicators Engaged in Science

Modules used: A1, B1, B2

Science Centre

2012

This is a standardized version of the original case analysis number 29. Specific names and locations have been substituted from the original document number 29 with generic references in order to preserve the anonymity of every participant.

If you would like to read the original document, please contact occ@upf.edu.

Contents

Abstract

This report is part of the project PLACES Impact Assessment (IA-WP6) within the Science in Society Initiative of the European Commission's FP7. The report follows the 'Guidelines for the Elaboration of Case Study Reports' prepared by the project coordinator of IA-WP6, the Scientific Communication Observatory (OCC) of Pompeu Fabra University in Barcelona, in 2012.

This report aims to explore how local impacts of this science centre are perceived by involved stakeholders and visitors. By drawing on semi-structured interviews and document analysis the perceived local impacts are analysed on two dimensions: impacts on the political sphere, and impacts on the public. The results show that stakeholders observe an impact of the science centre on what is called the 'political sphere' (mainly on the economy, the quality of life and education) although the impact is described as being modest.

In addition, stakeholders do not expect a major change of local impacts in the future. Interviewed visitors of the science centre, in contrast, found it very difficult to estimate its local impacts on the political sphere and they denied that their visit to the science centre had any impact on themselves, such as raising their interest in science and technology, increasing their participation in discussions on science and technology, or changing their lifestyles.

Impacts of science communication initiatives and policies (SCIP) are very complex and intertwined. This report also evaluates the toolkit for the impact assessment of SCIP elaborated by the PLACES project, and it concludes with some recommendations.

Introduction

General introduction to the problem

The main goal of PLACES is to provide actors engaged in science communication initiatives and policies (SCIP) with instruments and tools 'to structure their science communication activities at city/regional level', thus facilitating the definition and promotion of 'cities of scientific culture'. Comprehensive impact assessment and evaluation of SCIP is deemed to be one important element in this endeavour. As a result, the PLACES project developed a toolkit of impact assessment which is intended to serve as a resource for actors engaged in SCIP (reference 12). Thirty case studies carried out all over Europe should contribute to its empirical validation.

These case studies follow a comprehensive approach to impact assessment taking into account multiple dimensions, hence focusing on the collective rather than the individual effects of science communication. This study is in line with Garnett (reference 8) who suggests broadening the scope by including the social, political and economic dimensions in the study of impact.

The case study reported here pursues three objectives:

- To contribute to the assessment of the impact of SCIP on society at local/regional level;
- To contribute to the evaluation of the instruments (toolkit) used for impact assessment;
- To develop recommendations for future actions for 'cities of scientific culture' (as defined by the toolkit).

Research questions

In general, our study examines the perception and assessment of impact from the perspectives of different actors concerned with local science communication activities. These actors are characterized by their :

- Specific knowledge about the actual impacts of SCIP [perceived impact];
- And their specific interests regarding the desired effects of SCIP [expected/intended impact].

Therefore, we ask for (a) the perceived impacts of a SCIP at city/regional level and (b) what is deemed important when it comes to science communication.

The level of impact of our inquiry is based on a science centre as the agent that is responsible for the SCIP. The impact of the science centre's activities is observed on two dimensions, namely, on the public and on the political sphere. Each dimension is analysed pertaining to relevant *areas* of impact, which include the immediate and long-term effects on visitors (public) and the impact on the urban economy, culture, policies, and education (political sphere).

The rationale for case selection

The history of the science centre which is the case for our study goes back to 1947 when an association was founded for the purpose of establishing a technical museum in this country. In 1969 the foundation was incorporated and defined by its specific function of promoting 'Science and Technology in a living exhibition'. Finally, in 1982 the centre opened its doors to the public displaying exhibits such as machinery and apparatus provided by regional industry. It was the centre's director from 1990 to 2008 who heralded the transformation of the technical museum into a science centre, mainly inspired by the Exploratorium in San Francisco.

Thus, a new model was developed, implemented and accomplished in 2000. These developments implied a reorientation of the exhibition concept and the target group leading to a significant increase in the numbers of visitors. In 2011 the science centre attracted 255,858 visitors, 60,478 of whom were school students. A large part of these visitors come from other areas of the country than the main area, and many visiting school students were from another country.

Five hundred 'experiment stations' are displayed on a floor area of about 6,500 square metres. The exhibits are defined as 'educational presentations of natural phenomena' which require interactive exploration or 'hands-on inquiry'. Divided into thematic areas, the science centre offers diverse experimental approaches to topics such as mathematics, mechanics, human perception, magnetism, and electricity. Furthermore, a special exhibition as well as regular demonstrations of natural and technical phenomena, for instance, lightning, ozone depletion, or superconductivity, supplements the permanent exhibition. A 'youth laboratory' allows school students to conduct biological, chemical, and physical experiments under professional supervision.

The science centre has a broad definition of its target audience. It seeks to serve both as a leisure facility and a site of informal learning. Its educational

mission is reflected in special programmes created for school classes and teachers. Being a member of a science education organization, a network of educational institutions in native-language-speaking, the science centre is involved in improving science education in schools and kindergartens. Therefore, it offers further educational programmes designed for teachers.

The science centre is directed by a non-profit foundation. Fifty-nine per cent of its budget is self-financed, mainly through admission and sales. Public governmental authorities provide 30%, with another 11% being made up of donations by private individuals, foundations, and firms. A public support group and a business club seek to ensure sustainable sponsorship. The foundations' member structure reflects how the science centre is embedded within the several political, economic, scientific and cultural actors that volunteer to participate in the foundation council, the advisory board and the support groups.

With a population of around 106,000 this is the country's sixth-largest city and is situated 20 kilometres from the capital. The city's economic history is closely connected with the science centre. In the 19th century this city became an industrial centre whose economic growth fed on the railway industry, heavy industry and textile production. Until the 1970s the city's economic power mainly depended on the machine and engineering industry. Two local companies became symbols of this industry. Since the late 1980s and early 1990s the city has been experiencing the repercussions of a structural transformation which has led to downsizing in the industrial sector and a transition to a service-based economy. Today, most employees (44,048 out of 56,647) work in the tertiary sector. In the past few years, the city has made huge efforts in city marketing and has been quite successful in attracting both new companies and more inhabitants. The city's urban development department expects considerable demographic growth during the next 25 years.

Today, according to its self-description, the economic region of this city is conceived as a centre for mechanical and high-tech engineering, and mechatronics. In the tertiary sector the insurance business and the healthcare sector play an important role. In addition, the city also claims to be a centre for practice-oriented education, accommodating one of the major multidepartment universities of applied sciences in the country. Thus, education and applied research are considered to be one important location factor, including attempts to create incentives for innovation such as the promotion of knowledge-transfer between schools and the private sector, as done for example by the city's technology park . A further marketing strategy builds on the image of the city as a city of museums.

The city's structural transformation is part of what is commonly referred to as the transformation from an industrial to a knowledge-based society. This transformation is well reflected in the historical development of the science

centre, which experienced a shift from being an industrial museum exhibiting machinery from local industry towards a science centre offering new concepts in science education in the 1990s.

Factors making the case a desirable selection for the study

There are different factors which make the science centre a suitable case for the purpose of our study. Besides meeting the formal requirements of a science centre, and yet being the only one in this country, it can be understood as a central node in a network of diverse actors characterized by their specific interests in promoting a culture of science and technology. In this regard, the case offers various and valuable perspectives on the (perceived) impact of SCIP in a local context.

Methods

The PLACES toolkit offers seven instruments ('modules') for the study of a science centre's impact and its evaluation. Each of these modules is coupled to a specific 'dimension' of impact which indicates a group of actors affected by SCIP: its visitors, observers and stakeholders, and actors actively involved in it. In other words, these dimensions express 'the most relevant and representative' spheres of impact to be studied: the public, the local political sphere, and involved actors.

	Science Centre
Public	**Institutional Sources:** about visitors (documents, website, information from organizer)
	Module A1: Semi-structured interviews with visitors (including module for repeat visitors about long-term impact)
	Module A2: Standardized survey of visitors
Policy Sphere	**Module B1**: Semi-structured interviews with observers or stakeholders
	Module B2: Document analysis
Actors	M**odule C1**: Semi-structured interviews with relevant actors
	Module C2: Focus group with relevant actors

Table 1. Dimensions and instruments as developed in the PLACES Toolkit and as selected for this study (PLACES 2011, p. 23 f.)

Our report studies two dimensions of impact of the science centre: impact on the public, and impact on the political sphere. For each dimension two instruments (module A1 and institutional sources for the impact on the public; modules B1 and B2 for the impact on the political sphere) were chosen for the assessment and evaluation of impact. This means that data was derived from semi-structured interviews, institutional sources, and documents, and was then qualitatively analysed.

We relied on qualitative rather than quantitative techniques in data collection and analysis. This implies an approach which does not aim at measuring impact but rather at exploring its situational, contextual meaning as

expressed by visitors and stakeholders of the science centre. As Garnett (reference 8) points out, there is a need for the study of the societal, political and economic impact of science centres, and of long-term effects on individuals. We decided to give priority to stakeholders' and visitors' views in assessing such impacts.

Data collection

The sample consists of two classes of actors each representing one dimension of impact: one class comprises the visitors to the Science Centre representing the impact on the public; the other includes stakeholders and observers which represent the Science Centre's impact at local/regional level. We conducted semi-structured interviews following a guideline which has been designed for each class of actors addressing the relevant categories of impact (reference 11). All interviews were conducted face-to-face in June and July 2012. Because the interviews were semi-structured, interviewees were given the opportunity to reflect freely on the given concepts and topics.

Visitors were interviewed on-site immediately after their visit to the science centre. Interviewees were recruited on both a weekday (Thursday) and a weekend day (Saturday) since weekday visitors are mainly school classes whereas at weekends it is mostly families that visit the centre. For the purpose of taking both short-term and long-term effects into account, first-time visitors were distinguished from recurrent visitors.

In sum, 29 interviews were carried out, 12 with first-time and 17 with recurrent visitors. Most of the interviewees were teachers or families; only a few were school students. The interview questions addressed common concepts of individual impact, for example science learning, attitudes to science, personal interest and motivation, as well as gains in self-esteem and confidence. Long-term effects were mainly covered by questions about perceived changes in visitors' intellectual and practical engagement with science and technology (citizenship, intellectual curiosity).

The class of stakeholders was defined by two criteria. On one hand, interviewees regarded as stakeholders represent distinct knowledge allowing for the assessment of the science centre's impact at local/regional level. On the other hand, they are assumed to represent the diversity of the city/region's interests and expectations of the effects of the science centre in particular, and of SCIP in general.

Therefore, interviewees were selected with regard to a diversity of perspectives on the subject dependent on the local context of the science centre. In the city, several actors are involved in the promotion of an urban or regional culture of science and technology and their points of view have to be

considered in the study. Altogether, eight stakeholders were interviewed: two representatives of the science centre and its support groups, three stakeholders from the city's political sphere and one regional observer. Stakeholders and observers were asked to elaborate on questions which relate to four areas of impact, particularly socio-economic, cultural, political and educational areas.

Interviews with the managing director and the exhibition manager of the science centre provided valuable information about the science centre's goals, expectations, and strategies. They also allowed for a separate assessment of the expected and perceived impact.

Furthermore, we hoped to gain insight into which demands are put on the political and economic sphere from a stakeholder perspective. Due to the principle of bringing in different viewpoints on the subject, the information obtained by the centre's representatives was contrasted with interviews we conducted with actors from the local political sphere. Those were selected according to the definition of areas of impact as stated in the toolkit, particularly, tourism, culture, and economics.

Thus, we interviewed the directors of the local office of tourism, the city's department of culture and the office of location promotion of the city's region'. Each actor was regarded as speaking as both an observer of the overall local effects and an expert/stakeholder in one specific area of impact.

We identified one further group of actors whose statements appeared to be instructive for the aim of our study. That is why we also included the president of the centre and the managing director of the business network in our sample. Both actors represent the economic sphere and, hence, have their own interests in actively promoting science communication. They also incorporate a historical perspective since they experienced the structural transformation of the city. Finally, with the selection of one regional observer, namely the director of the local division of cultural affairs, we intended to explore the regional relevance of the centre.

Further data was collected from institutional sources and from a document and website analysis. First, we looked for websites, documents and institutional data that could provide additional information about the visitors to the science centre. Then our document search focused on self-descriptive, institutional texts which would allow for insights into strategies and/or evaluations regarding SCIP in the city. Documents and websites provided contextual information which facilitated the recruitment of relevant actors and interviews, and the conducting of the interviews (cf. 3.2). During research we became aware of a lack of institutional data or quantified knowledge about the impacts of the science centre on their visitors and on the political sphere.

Data analysis

Qualitative Content Analysis of the Interview Data

The interviews were partially transcribed and qualitatively analysed. The content analysis of the textual data followed an approach best described as deductive category application as formulated by Mayring (reference 11). That is, categories which also thematically structured the interviews guided the process of interpretation. Thus, the goal was to explore and subsequently summarize the participants' interpretations of those categories.

Qualitative Document Analysis

Incorporating documents into the research process acknowledges the variety of ways in which the setting being studied represents itself. Documents can be conceived as results of practices of 'self-recording', i.e. text and images, which have been recorded without the interference of a scholarly observer. Thus, documents are a valuable source whose analysis can corroborate, complement and challenge information obtained from other sources or conclusions already drawn.

Following the definition of purpose by Bowen (reference 3), we mainly drew on institutional documents as background and context information. The corpus consists of self-descriptive texts like institutional websites, corporate brochures, business reports, and media coverage of the science centre. The analysis of these texts allowed valuable insight into the relevance and expectations attributed to SCIP in the city and their impact. Our main focus, however, was on the analysis of the conducted interviews.

Modifications made to the toolkit

Besides a translation of the interview guidelines due to the language area of investigation, further minor modifications were made to the interview guideline in the case of the stakeholders (module B1). First, we decided to rearrange its thematic structure, which is made up of four impact areas, in the following order: impact on policy, impact on quality of life, social/economic impacts, and education.

In fact, we started out by first addressing potential socio-economic effects; subsequently, we segued from cultural identity and quality of life into issues of educational impact; finally, we closed with the questions on the impact on policies. It was easier for interviewees to begin by reflecting on specific economic impacts than by addressing the 'overall added-value' of a local 'culture of science and technology', which was the first question listed under the policy section in the guideline.

Secondly, we developed additional questions, which were asked after going through the guideline. In line with our intention to learn about the prerequisites of SCIP, interviewees were asked which goals, aspirations and desired effects they associated with science communication. We also asked for their recommendations regarding effective strategies in the promotion of SCIP.

Results

Impact on the political sphere

In this section we discuss stakeholders' perceived and expected local and regional impacts of the science centre on the political sphere. As mentioned in the methods section (3.1), four interviewed stakeholders are closely linked to the science centre, namely its managing director, its exhibition manager, the president of the science centre foundation, and the managing director of the science centre business partnership. Three interviewed stakeholders represent the political sphere of the city, namely the director of the local promotion of the city's region, the director of the local office of tourism, and the director of the city's department of culture. The interviewed regional observer is the director of the division of cultural affairs of the region.

Social and economic impacts

The interviewed stakeholders are all convinced that the science centre exerts some immediate local and regional socio-economic effects. First of all, according to the stakeholders, local and regional entrepreneurs profit from the centre's investments in infrastructure. Local entrepreneurs are engaged in the maintenance of the museum building and in its current enlargement.

The science centre's representatives (managing director and exhibition manager) say that the construction of the new 'youth laboratory' includes an investment volume of €8,028,259, which is mainly spent locally. In the past, entrepreneurs from the city and surroundings were also involved in both the construction of the museum building and the establishment of a bus service between the science centre and the city's railway station.

In the view of the science centre's representatives, some economic impact is immediately created by the science centre's commercial needs such as the printing of brochures and the supply for its restaurant. Both the managing director and the exhibition manager emphasize that the exhibited museum objects are all made by the science centre with the support of local suppliers. Some objects are sold to science museums abroad, which creates additional income, following the entrance tickets and the museum shop.

According to the exhibition manager, the science centre employs approximately 100 people, most of whom come from the city and its surroundings. The president of the centre's foundation also points to the jobs created by the development of the city's University of Applied Sciences, the former engineering school, which according to the office of location promotion

has about 2,000 employees. The managing director of the business network points to long-term effects on professions and professionals. In his opinion the science centre motivates young people to consider a career in a science- and technology-based profession. Such interest would attract experts and high potentials with a background in science and technology to the city.

Interviewed stakeholders perceive some public/private interactions of science communication actors in the city. The exhibition manager points to the co-financing of the new 'youth laboratory', which is supported by both public and private institutions. In addition, public events and exhibitions are sometimes co-organized by the science centre and business partners. According to the president of the science centre foundation, the science centre is becoming an increasingly popular location for external events with companies renting space in the centre for their customer events and anniversaries. The business network's managing director points out that companies also sponsor school classes visiting the centre.

The location promotion office fosters public/private collaborations in science and technology in general. In the opinion of its director, such collaborations are initiated mostly by his office, and not by the science centre or the University of Applied Sciences. One of the most important projects in his opinion is the technology park, a building providing service which is co-financed by the university and some companies.

Most interviewed stakeholders mention the importance of the science centre as a tourist attraction. With the exception of the director of the city's department of culture, they all perceive some impact of the science centre on local tourism although the effects are judged as being quite moderate. The science centre visitors usually visit for just one day. In the view of the president of the science centre foundation, visiting the centre takes all day and prevents visitors going to the city. Many school classes drive in by bus and leave the city immediately after their visit to the science centre. The centre's peripheral location is a further reason that keeps many tourists away from the city. Visitors who do get into the city mostly visit during the day, which the managing director says is good for local gastronomy.

Taking a broader perspective, the head of the local office of tourism believes that science communication activities in general have a major impact on local tourism. While in his opinion the science centre plays a minor role in this respect, educational courses and conferences organized by the University of Applied Sciences would attract a substantial number of people staying in hotels. In addition, such activities would generate tax income for the city. The science centre's managing director highlights that tourism should not be a primary aim of a science centre. Science communication, in his view, must be

considered as a societal duty and the exhibitions should serve an educational rather than a tourist objective.

The science centre's representatives are convinced that it is the region which benefits most from the science centre in economic terms. The managing director says:

'Two years ago, we made a calculation concerning the subsidies we get from the city, the region, and the country: almost every single cent we get goes back to the region and the entrepreneurs in the city, the region, and the country.' (Kü_1 02:22)

Similarly, the exhibition manager claims that 'at the end of the day, the city profits much more from us than it has to pay us' (Ju 04:35). The stakeholders all believe that the science centre has a positive effect on the city's image and reputation. The president of the science centre's foundation claims:

'The science centre is also positive for the city in terms of international reputation. I think I may say that we are among the best science centres in Europe and worldwide, thus contributing to the city's image and reputation.' (Vo 00:31:33)

The director of the local office of tourism classifies the science centre as 'a beacon' and a 'substantial image factor' of the city (Re 06:13).

Expected future impacts

The interviewed stakeholders all agree that the socio-economic impacts of the science centre will not change dramatically in the future but will rather change modestly, if at all. The stakeholders expect a slight increase in the effects because of planned future activities and cooperation. The new 'youth laboratory' will attract more visitors, and stakeholders expect that public/private cooperation will increase in the future.

The science centre's representatives plan to intensify cooperation with other museums (managing director), and expect that even more projects will be co-financed by public and private institutions in the future (exhibition manager). The president of the science centre's foundation also points to planned collaborations with schools which do not have their own laboratories.

According to several stakeholders, future infrastructure projects include rebuilding the science centre park, building a multi-functional theatre, and establishing a more direct bus service. Once these projects are in place, stakeholders expect positive economic effects for participating local entrepreneurs and an increase in visitors to the science centre. The science centre's representatives expect some new sources of income because of more educational activities addressed to small children and planned merchandising

activities of the museum shop. Because of the establishment of the new 'youth laboratory', new infrastructural projects, and planned future cooperation and activities, the exhibition manager guesses that there will be about 60 new jobs created in the science centre by 2020.

Considering SCIPs more generally, the directors of the offices of tourism and of location promotion anticipate a strong development of the University of Applied Sciences in the years to come. The construction of new buildings and an increased number of students will exert impacts on local business, tourism, and gastronomy, according to these stakeholders.

Impacts on cultural identity and quality of life

The overall perceptions of the science centre's effects on the quality of life in the city are diverse. The centre's representatives are convinced that it has a strong impact. The exhibition manager holds:

> *'[The people from the city] have a top tourist and education destination on their doorstep. That's quality of life.'* (Ju 22:49)

The managing director of the business network defines quality of life in mere economic terms. He is thus convinced that the science centre 'obviously' contributes to the quality of life because of its impact on the city's reputation and the local economy (Il 08:50). The stakeholders who are not closely linked to the science centre are less enthusiastic. The directors of the office of tourism and the city's department of culture acknowledge that cultural and educational institutions do always contribute to improve the quality of life. However, they do not believe that the contribution of the science centre is more relevant than the implications of any other museum in the city. In their opinions, the University of Applied Sciences is much more important in shaping the quality of life in the city.

The judgements about the implications of the science centre on the city's cultural identity are somewhat vague. While the science centre's foundation president believes that there is no immediate connection between the science centre and the city's cultural identity, and the business network's managing director finds such relationship difficult to evaluate, most other stakeholders point to the long industrial tradition of the city as key for its cultural identity. In their views, people in the city feel part of an innovative culture which has invented and developed many industrial products in the past. The director of the office of location promotion comments that research and development, education, and cultural institutions are important dimensions of the city's cultural identity today. Highlighting the structural crisis of the city's industry in the late 1980s and early 1990s, he asserts:

'After having suffered in the past, the city is now quite self-confident and calls itself an educational city and, well, still an industrial city but mainly a technological city. The people of this city are very much influenced by that.' (Do 30:24)

The city, he claims, would also have a self-understanding as a 'city of museums' (Do 32:54). The director of the city's department of culture adds that the city marketing uses labels such as 'city of pioneers' and 'site of innovation' (Ku 19:53). In the view of the director of the tourist office, science and technology are very well integrated in the daily life of the public.

Many local traditions, institutions, and activities are related to the industrial tradition such as the established 'industrial trail' which recalls important historic industrial pioneers and places. However, the science centre is not mentioned as playing a particular part in shaping the city's cultural identity by interviewed stakeholders. The exhibition manager is the only interviewee who believes that the science centre fills a vacuum caused by the structural change of the city in the past, thus becoming an important dimension of the city's cultural identity.

The opinions about the impact of the science centre's activities on public participation are very similar. While all stakeholders acknowledge a very lively culture of public participation in the city, the large interest is seen as being rooted in the city's industrial tradition and history, and not induced by the centre's activities.

The stakeholders located downtown (office of tourism, office of location promotion, culture department) point to the engagement of citizens in environmental issues and in discussions about sustainability. The location of the 'Club of Rome' in the city is seen, however, as more influential on public engagement than the presence of the science centre.

The centre's science communication activities are well received by local media in the opinion of most stakeholders, including the external observer. Media coverage is not just local but extends to national TV and to media in the country.

The president of the science centre's foundation believes that the coverage of local media has improved a lot in the last five years, although in the opinion of the director of the city's department of culture, local media articles are often uncritical reproductions of press statements.

This science centre representatives feel that it is increasingly perceived as an expert institution by various media; it is contacted by journalists whenever an explanation of a science phenomenon is needed. The media thus acknowledge the science centre's role as a mediator between science and the public.

Expected future impacts

Stakeholders expect that research and technology will remain very important dimensions of the city's cultural identity but the science centre is seen by most stakeholders as a less important impact factor than the University of Applied Sciences. In the view of the managing director, the science centre should continue to foster the population's positive attitude towards science and technology.

While most stakeholders expect a continuing interest in public participation, the exhibition manager is the only one who considers that the science centre may have a long term effect on public participation because it raises curiosity and interest in science and technology among young people. He also expects slightly increased media coverage because of the larger number of activities at the science centre in the future.

Impacts on education

According to the centre's representatives their institution is the largest site for out-of-school learning in the country. The managing director reports that 60,000 pupils visit it each year, with an upward trend. The exhibition manager's view is that the laboratories are especially frequented by schools and that 'out-of-school learning sites' are:

'*Not a replacement for schools. They do not replace school teaching but can inspire it.'* (Ju 56:26)

The science centre is acknowledged to have some local impact on education because all school students in the city are familiar with it, as the director of the office of location promotion claims:

'I think it is mandatory for every single pupil from the city to visit the science centre once in his or her school career. That's simply part of it.' (Do 41:32)

Visiting the science centre is free for school classes from the city (it is paid for by the city); the entrance fees from all other schools are, according to the director of the city's cultural department, the centre's main income source.

The centre's activities involve the development of new courses for school teachers. The exhibition manager is convinced that such educational efforts are indispensable for making school visits effective. The educational courses for teachers are, in his view, very successful, and the science centre intends to employ more staff to serve these needs.

Interested teachers come from all over the country and from abroad. The director of the office of location promotion also points to a study course on

science communication established by the University of Applied Sciences, and to some classes in science communication offered in the engineering school.

According to the science centre's representatives, no educational material has been developed so far. The managing director does not consider this a task to be fulfilled by science centre. However, he says that an experiment in the science centre inspired the authors of a schoolbook and the development of a distribution company that specializes in educational materials was closely linked to the centre.

In the views of the stakeholders there is an increasing involvement of scientific laboratories and technological firms in public science communication activities. The president of the science centre's foundation says that companies have been organizing ''open days for many years with the aim of attracting skilled trainees (Vo 44:54). According to the exhibition manager, the science centre regularly participates in public communication events organized by other science-based institutions.

Expected future impacts

The science centre's representatives expect an increasing number of school visits, thus amplifying its impact on education. The director of the office of location promotion considers that even more technology firms will open their doors to the public in the future.

Impacts on (local) policy and the fostering of a 'culture of science and technology'

The interviewed stakeholders are convinced that political authorities play an important role in stimulating a 'culture of science and technology' in the city. There are four fields in which the involvement of local and regional authorities is considered particularly important by the interviewees.

First, stakeholders acknowledge the role of city's authorities in defining and setting up a general framework in which research, education, and business activities may develop. Such a framework includes, for example, urban planning and infrastructure projects. Secondly, the financial support of institutions engaged in R&D and in science education is regarded as crucial. Stakeholders believe that the city is much more engaged in that respect than its region is.

The president of the science centre's foundation tells how he had to struggle to convince the government to support his institution and that the city still pays almost as much in subsidies to the science centre as the government does. Thirdly, stakeholders appreciate the local authorities' respect for the important role of technology and education by defining them as key success factors for the city. Finally, the fostering of networks and networking, especially

between public and private actors, is considered an important task of local and regional authorities. The interviewees believe that the local authorities are very active in all these fields.

When asked what they considered to be the most effective policies to foster a 'culture of science and technology' in the city, stakeholders answered by pointing to the four fields mentioned above. Such answering behaviour suggests that stakeholders seem quite satisfied with the local authorities' policies in the past. The regional observer confirms that in her view the city's authorities are very active in fostering an innovative culture and in promoting the city.

However, the relevance of the four fields was emphasized differently in the stakeholders' answers compared to the answers above. The financial support was now given the most emphasis, followed by networking, the establishment of a valuable general framework, and finally the respect for both the industrial tradition and the important role of science and technology for the development of the city. In detail, the science centre's representatives consider the financial support as most important to foster educational activities and organize more events. They believe that future activities should also address younger children.

Most stakeholders are convinced that the cooperation between the industrial companies were decisive in creating a local 'culture of science and technology' in the city.

The overall added value of such a local 'culture of science and technology' is mainly defined by stakeholders in three respects. First, they believe that a positive societal attitude towards science and technology raises the interest in science and technology among young people and motivates them to pursue a career in a science or technology-based firm. Secondly, a great benefit is seen in economic terms. The director of the city's cultural department explains:

'*The aim to settle more technology companies in our city is motivated by the need for more tax income. That is a big issue in this city. When the industry broke down, the city was almost bankrupt. I think it is going much better now but the city still has to struggle.'* (Kur 29:49)

In addition to financial effects, the impact on cultural identity is seen as a third added value of a 'culture of science and technology'. The cultural department's director holds that 'the important role of science and technology is part of our consciousness' (Kur 28:59), and the director of the office of location promotion asserts:

'[The culture of science and technology] is part of the self-understanding of the public. It is part of their identity, which is very valuable. This keeps people grounded.' (Do 48:11)

As a part of this culture, the public shape decisions on science and technology, especially in environmental issues, as several stakeholders report. In addition, stakeholders recall, new partnerships have emerged between local businesses in the context of science communication activities in the past, such as a current initiative which is a network between science and the industry in the sustainable energy sector.

Expected future impacts

With regard to future developments, stakeholders expect that public-private cooperation will be intensified in the future. They also believe that research, technology and education will remain very important key success factors for the city in the future.

Impact on the public

The views of visitors on the science centre's impact on both the region and visitors themselves will be explored in this section. We interviewed both first-time and repeat visitors to inquire into immediate and long-term effects.

Local Impact

Most interviewed visitors were adults from other regions or from abroad. We met few people from the city. This may explain why it was very difficult for visitors to estimate the local impact of the science centre. When asked if they thought it was an important institution for the city, they mostly said 'Yes, I think so' (VMR01 05:14). However, the explanations were quite vague.

Visitors either considered it to be a 'generally positive thing' (VFR07 14:07) to have such a museum in town, or they pointed to supposed tourist and educational impacts (VMR02 06:21). Some visitors believe that the science centre 'could just as well exist somewhere else' (VGG06 01:46), and others were simply not able to answer the question like the visitor who said: 'I can't tell' (VFR03 02:15).

Hardly any of the interviewed visitors intended to go downtown after spending the day in the science centre. Answers included statements like: 'No, we are just here to visit the science centre and we haven't got through so far' (VFF 10 02:48), or 'We have been here [at the science centre] all day long and have not seen everything yet' (VMF11 02:55).

Personal Impacts

Interviewed visitors had mainly two motives to visit the science centre. On the one hand, visitors expected to learn something and obtain a better understanding of the natural sciences. Parents of school students showed a particular interest in that aspect; they aimed at passing on their personal and professional interests in science and technology to their children. Adults with a motivation to learn often expressed a professional interest in science and technology in general, or in the exhibitions in particular.

Obviously, teachers referred to the learning motive as well. On the other hand, most visitors were looking for fun and were simply hoping to have a good time while visiting the science centre. Many repeat visitors highlighted that aspect like a male adult who said:

'It is always fun to come here. For the kids, too. We really like it very much.' (VMR09 00:15)

For most visitors both learning and entertainment were important motives. These motives correspond to the science centre's concerns (cf. 2.3). Many families planned to visit the centre as a one-day getaway. Some adults were motivated by children to make this excursion and became more interested while visiting the exhibitions. A female visitor said:

'We are actually here with our nephews […] but in the meantime we noticed that we like it as much as they do.' (VMR09 00:15)

In line with their reasons for visiting the centre, interviewees perceive it as both learning and a fun environment. They all appreciate the interactive hands-on approach of the exhibitions which in their experience is simply fun and also allows for a playful and experiential understanding of phenomena. For example, when asked about what she liked most a female visitor said:

*'[I liked best] that you can try lots of things out on your own and can touch the things. […].' (*VFF 10 01:08)

Most interviewees perceive the science centre as a site which addresses people of all ages and in which families are welcome. A male visitor had this to say:

'[It] is very family-friendly. [There are] picnic corners where you can eat your own food; [there is] a room to leave your luggage. [It is] spacious, ample.' (VMR02 05:27)

Criticisms were very rare and, if expressed at all, either referred to the long journey or the entrance fees which were thought to be quite high by visitors from abroad.

While interviewed visitors all liked the science centre, they denied that their visit to the science centre had any personal impact. In their opinion they didn't feel more confident discussing scientific issues as a result of their visit to the science centre. Repeat visitors said that their visit had no effect on their intellectual curiosity in science and technology and that they had not followed more stories about these issues in the news after their last visit. In their assessments, their visit also had no effect on their involvement in S&T policy-related events.

Interviewees who regularly participate in public discussions and events about science and technology did not see the science centre as a reason for their interest in these issues; rather, they believed their interest was the motivation to visit the science centre and participate in discussions and events. Finally, repeat visitors did not notice a change in their own consumer behaviour, nor did they claim to have incorporated healthier habits and a more environmentally friendly lifestyle as a result of their visit to the science centre.

Conclusions

The results showed a perceived impact of the science centre on the political sphere. The interviewed stakeholders of the science centre all believe that the centre exerts some local impact on the economy, quality of life, and education. However, the impact is described as being quite modest. Stakeholders do not expect a major change of local impacts on the political sphere in the future. They also perceive a local tradition of a 'culture of science and technology' and acknowledge the active role of the city's authorities to further such culture.

However, when looking at local impacts of SCIP more broadly, stakeholders' perceptions of the role of the science centre are divergent. While the science centre's representatives did not compare their institution to other local ones, stakeholders located in the city centre (directors of the offices of tourism and location promotion and of the city's department of culture) estimate that the University of Applied Sciences is more important for the degree of local impact and will remain more important in the future.

The latter stakeholders also believe that, in contrast to the science centre, the University of Applied Sciences has played a crucial role in the emergence of the local 'culture of science and technology' and will continue to be a more important part of it in the future.

While perceptions of science (and, we would add, of science communication activities) are always shaped by contexts, and individuals draw from different and overlapping thought collectives (reference 5), divergent perceptions in the case of the science centre may also be a result of the different locations of the stakeholders' institutions. The peripheral site of the science centre is seen as unfavourable in particular by the science centre's representatives, who would prefer to be located downtown.

Interviewed visitors to the science centre found it very difficult to estimate its local impact on the political sphere and were not able to express an opinion on this issue. In addition, they negated the science centre's impacts on the public. The interviewees denied that their visit to the science centre had any impact on themselves, such as raising their interest in science and technology, increasing their participation in discussions on science and technology, or changing their lifestyles.

According to several stakeholders, citizens who participate in many public discussions already have science and technology well integrated into their daily lives. At least in respect of the members of the public this may

explain why they see their visit as a consequence of their interest in science and technology rather than a reason for it.

Stakeholders acknowledge the important role of R&D and education in both the self-understanding and the future of the city. While technology and education are defined as key success factors by the city authorities, science is not explicitly mentioned in city marketing strategies or on the official websites of the city. Nevertheless, science and technology both have a strong public presence in the city, and the city authorities and involved stakeholders are very aware of their important role for the further development of the city. This city thus meets the criteria of a ‘City of Scientific Culture’ and can be defined as such.

Recommendations

Recommendations for the improvement of the science centre's local impact

Recommendations of stakeholders and observers

Stakeholders made several suggestions to facilitate the science centre's local impact and foster the 'culture of science and technology'. In the view of the science centre's representatives more financial subsidies and better cooperation with other institutions would help to make it even more effective. In their opinion, more money would make it possible to increase the number of educational activities for both teachers and pupils, and to organize more public events.

The centre's representatives believe that this would increase its public resonance and make its activities more visible. In addition, the centre's representatives express some self-recommendations, such as extending the scope of the courses for school teachers to infants and increasing the focus on experience and adventure. The directors of the offices of tourism and location promotion, and of the city's department of culture, support the idea of increasing cooperation among local institutions which are involved in science communication. In addition, they ask for better coordination of existing activities.

Finally, the regional observer requests a change of responsibilities within the regional administration. In her view, the science centre should not be supported by the region's division of cultural affairs but by the department of education.

While all stakeholders thus plead to optimize what is already there, the centre's representatives ask further for an enlargement of activities. In detail, the following recommendations were made:

Recommendations to the science centre:

- To extend the scope of the courses for school teachers to children at a very young age.
- To increase the focus on experience and adventure.
- To make the science centre more visible in the public by organizing more public activities such as a science festival.

- To increase cooperation and coordination with local institutions engaged in science and science communication, and with local businesses.

Recommendations to companies:

- To increase cooperation with local institutions engaged in science and science communication.

- To increase the funding of school classes' visits to the science centre.

Recommendations to politicians and institutions involved in city development:

- To foster the local (industrial) traditions and culture, including a 'culture of location promotion' and a 'culture of (industrial) production' instead of a mere culture of services.

- To help better coordinate local activities on science and technology organized by different institutions.

- To establish a more direct bus service between the science centre and the railway station.

- To change the organizational responsibility for the science centre within the cantonal administration from the division of Cultural Affairs to the Department of Education.

- To further investment in education.

- To make more money available for evaluations.

- To increase the visibility of science and technology and of institutions of science communication in society and foster a 'culture of science and technology'.

Recommendations to EU authorities:

- To de-bureaucratize its funding services.

Recommendations to the public and society:

- To increase the presence of science and technology and foster a 'culture of science and technology'.

Authors' recommendations

The science centre is innovative and very successful and makes continuous efforts to improve its high-standing educational services. Its target group is not

limited to local schools, teachers, and visitors but includes a much broader population from our country and abroad. The city development is thus not in the main focus of the centre's representatives. In addition, the science centre is unique in this country and is not under competition pressure.

Nevertheless, the centre could profit from closer collaboration with local institutions engaged in science and technology. One option would be to establish a round table in which stakeholders in science and technology would come together to adjust their interests and strategies.

In addition, the city's authorities might consider putting more emphasis on science and research in their city marketing, for example by marketing the city as a 'city of science and technology'.

Recommendations for the Places toolkit

The appropriateness of the instruments should be reviewed with regard to the specific group of actors studied. While the interview guideline employed for the group of stakeholders (module B1) proved to be useful, the research design of the assessment of individual impact on visitors (module A1) has to be discussed more thoroughly.

Stakeholders

In the case of the group of stakeholders, the interview process revealed that not all of the categories are of relevance to the respondents and hence could not be covered sufficiently. For example, most of the stakeholders (5 out of 8) were not able to assess the impact on education since their specific role does not require knowledge about such outcomes. This means that the guideline as provided by the PLACES toolkit cannot be generally applied to each interview situation but rather needs to be adapted to the specific knowledge and position of the actor.

That is, to give weight to the dimensions for which the interviewee is regarded an expert, for instance, to focus on issues of cultural impact when interviewing a representative of the cultural sphere. Practically, this merely implied that the interviewer had to be sensitive to this issue and, when necessary, turn to other topics. For the purposes of the toolkit it should be taken into account that the interview guideline is considered to be a case-related and not a standardized instrument.

Moreover, there was a contrast between some questions posed and the respective answers: While the questions were often very specific about possible outcomes (like new jobs created, new sources of income, new educational material due to science communication activities), interviewees were more likely to give general impressions on potential effects. Hence, and due to a lack of institutional data, most of them were not in the position to specify but rather to

speculate on this topic. There should be discussion and exploration of whether the causal relations between science communication activities and manifest effects (such as public participation), as suggested by the guideline, are part of the explanatory concepts actors employ and can thus be assessed adequately.

Visitors

As a result of our experiences with the visitor study we believe that the tool used for the assessment of individual impact does not allow for a deep understanding of the phenomenon. Both the setting and the interview guideline provide arguments for this conclusion. The interviews took place in the science centre's main hall or in front of its entrance door. Visitors were recruited and interviewed while they were about to leave, mostly being in someone else's company. This setting did not make the interview process any easier since the interviewees were not able to take the time needed to reflect on the topics but rather felt constrained to answer efficiently.

Moreover, we suppose that allowing a spatial and temporal distance to their visit might facilitate the formation of a clearer opinion about their experiences in the science centre. This was not the only reason why not all the topics addressed during the interviews could be answered sufficiently. We also noticed that some categories did not match with the relevancies visitors attributed to their experience. For example, visitors denied a causal relation between their visit(s) to the science centre and potential effects like an increase in confidence and interest, or a growing involvement in science and technology related discourses and events as suggested by the interview guideline.

Therefore we suggest that impact on visitors should be studied in other contexts and with more time being given to the interviews, thus allowing interviewees to develop their own categories. Within a qualitative approach the study of the individual meaning of impact should be contextualized, for instance, by observing visitors while interacting with museum objects, and by inquiring into their interpretations made in relevant contexts, like the classroom or within the family.

We would finally like to draw attention to the question of whether measuring impact is of relevance to the actors at all. To date stakeholders of the science centre have engaged in science communication without being able to refer to quantified knowledge about its specific effects (economic, educational, cultural) on the region.

While it is true for the management of the science centre that statistical data about its societal effects might be a helpful and even desirable device, such as for fundraising, other stakeholders seem not to depend on this tool for evaluation or doubt that such effects can be measured at all. They have been

relying on their own experiences and on practical knowledge and beliefs about the local and trans-regional significance of their science centre in the past. This might be read as an indicator that the science centre is part of the city's culture and is widely accepted.

There are thus diverse expectations and needs regarding the need for a tool to measure impact. These are in turn shaped by institutional contexts and individual motives underlying the actions in the promotion of SCIP. Future research might inquire into the motives and rationale of actors engaged in the promotion of a scientific culture to become aware of what kind of tools the actors deem to be most supportive.

References

1. Atkinson, P. & Coffey, A. (1997) *Analysing Documentary Realities*. In: David Silverman (ed.): *Qualitative Research. Theory, Method, and Practice*. Sage, pp. 45-62. Thousand Oaks

2. Here the author refers to a book about the origins of the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

3. Bowen, GA. (2009) *Document Analysis as a Qualitative Research Method*. In: Qualitative Research 9 (2), 27-40.

4. European Network of science centres and Museums (2011) *Internal Regulations*. Available at: www.ecsite.eu/sites/default/files/ECSITE_Intern_Regul_FINAL_0.pdf, retrieved 07/17/2012.

5. Felt, U. (2003) *When Societies Encounter 'their' Sciences: Conceptualising the Relationships between Sciences and Publics*. In: Felt, Ulrike (ed.): *Optimising Public Understanding of Science and Technology*. Final Report, p. 16-46. Available at: sciencestudies.univie.ac.at/fileadmin/user_upload/dep_sciencestudies/pdf_files/final_report_opus.pdf, retrieved 07/17/2012

6. Forman, J. & Damschroder, L. (2008) *Qualitative Content Analysis*. In: Jacobi, Livia & Siminoff, Laura (ed.): *Empirical Methods for Bioethics*, Elsevier, p. 39-62. Amsterdam et al.

7. Here the author refers to a book about the different exhibitions of the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

8. Garnett, R. (2001) *The Impact of Science Centres/Museums on their Surrounding Communities: Summary Report*. Available at: http://alturl.com/py59g, retrieved 07/17/2012.

9. Hammersley, M. & Atkinson, P. (2005) *Ethnography*. London/New York, Routledge.

10. Macdonald, S. (2002) *Behind the Scenes at a Science Museum*. New York: Oxford.

11. Mayring, P. (2000) *Qualitative Content Analysis*. In: Forum Qualitative Sozialforschung / Forum: Qualitative Social Research. Available at: http://www.qualitative-research.net/index.php/fqs/article/view/1089/2385. Date accessed: 29 Nov. 2012.

12. De Semir et al. (2012) *The PLACES toolkit for the impact assessment of scince communication initiatives and policies*. Barcelona: Universitat Pompeu Fabra.

13. Schmidt, C. (2004*) The Analysis of Semi-structured Interviews*. In: Flick, Uwe; von Kardorff, Ernst; Steinke, Ines (ed.): A Companion to Qualitative Research., Sage, pp. 253-258. London et al.

Primary Sources

Institutional websites

14. Here the author refers to several websites related to the city, the event or the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

Image brochures, business reports, statistical data

15. Here the author refers to an article related to the promotion of the region where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

16. Here the author refers to an article about the economic development of the region in 2007 where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

17. Here the author refers to an article about the economic development of the region in 2012 where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

18. Here the author refers to an article about the economic development of the capital of the country where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

19. Here the author refers to an article about the foundation regulations of the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

20. Here the author refers to a statistical article about the key figures of the region where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

21. Here the author refers to an annual report of the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

Mass media coverage

22. Here the author refers to a book about the origins of the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

23. Here the author refers to a book about the different exhibitions of the science centre where this case study was performed. The name of this book has been suppressed in order to maintain the anonymity of this case report. If you need more information or wish to know more about it, please send a message to occ@upf.edu.

24. NZZ (2008) *A world-class science centre*. In: Neue Zürcher Zeitung