Platform of Local Authorities and Communicators Engaged in Science

Modules used: A2, B1, C2

Science Centre

2012

This is a standardized version of the original case analysis number 14. Specific names and locations have been substituted from the original document number 14 with generic references in order to preserve the anonymity of every participant.

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

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Abstract

Background

This science centre in its four years of existence has exceeded expectations by attracting a total of nearly 1 million visitors. The centre represents a distinctive type of science centre that has attracted media attention for science-related events and issues. The centre's exhibitions and events have been the object of social media conversations and sharing on a significant scale.

Research questions

The research reported here aimed to assess the impacts of the centre in scientific communities, among policy-makers, on personnel working with the centre and on the public in the city.

Methods

The methods applied were taken from the PLACES evaluation toolkit with modifications, mostly shortening. These were: Module A2: Standardized survey of visitors (n=219); Module B1: interviews with stakeholders (n=5); Module C2: focus group with actors (n=1, 5 participants).

Results

The results from each segment of research tended to confirm each other and the widely accepted view that the centre has in its fairly short life had significant impacts on the city.

Conclusions

The conduct of the case study demonstrated broadly the validity of the selected instruments in the PLACES toolkit but also the need for revisions, notably in the length and detail of the instruments.

Introduction

The centre is the only modern science centre in its country. It was established in 2008, and it is expected to receive its one-millionth visitor during summer 2012. It has an on-street location facing outwards to the public, in contrast with most of the college's buildings, which are not visible to the public in the street.

The centre considers itself to be a pioneer among science centres internationally by interpreting the sciences through the arts and seeking to provoke debate. Its target audience is young adults. The centre has no permanent exhibition, but hosts up to six temporary exhibitions per year. It also holds events and provides space for groups and talks by other organisations. It has a popular coffee shop and gift shop.

The collaboration between professional curators and researchers working in the selected field of study and the diversity of exhibits are representative of the centre's approach in general.

There are several well-established corporations that have provided either core sponsorship or event sponsorship to the centre. Other such sponsors include more companies, a charitable foundation, two government departments and the state's main research funding agency. In 2012 the centre received a 1 million€ grant from a company to help export the science centre mode of work to other cities. Announcements of partnerships with institutions in other cities are expected during summer 2012.

The selection of the centre as a PLACES case study was almost spontaneous, due to its status as the country's only modern science centre and its affiliation with the PLACES project through its membership of ECSITE. The research reported here aimed to assess the impacts of the centre at the levels of the public, the policy sphere and 'actors' (meaning those directly involved in the centre activities). Three different research methods were used for each of these levels: survey of visitors to the centre ("the public"); interviews with stakeholders in the policy sphere (also including the research, media and business communities); focus group of the centre personnel and a researcher who collaborated with the centre staff on an exhibition.

Methods

The methods applied in this case study were taken from the PLACES evaluation toolkit. These were: Module A2: Standardized survey of visitors (N=219); Module B1: semi-structured interviews with stakeholders (N=5); Module C2: focus group with actors (N=1, 5 participants).

The selection of methods was aimed to ensure that each of the three levels of impacts, as defined in the PLACES toolkit, was addressed.

Ideally, analysis of information from the centre would also have been included. Several requests were made to the centre for reports of previous evaluations. These requests were not met during the period of this research.

The survey of visitors leaving the centre (Result 1 in the following section) was conducted at the entrance/exit of the centre and the responses were collected in face-to-face interviews. Some consideration was given to installing a PC at the centre with an online version of the survey but, mainly for logistical reasons, this was not carried through. The surveys were continued until the recommended target of 200 completed responses was reached. The survey form used was just over half the length of the survey form proposed in the PLACES toolkit. It was considered that the full survey would take longer to complete than visitors would be comfortable with. The questions excluded were mainly questions on attitudes to science and technology of the kind (or precisely) used in Eurobarometer surveys. Responses of representative samples of the national public to those questions are already available.

The selection of five stakeholder interviewees was done by the main researcher with assistance from the centre personnel and was aimed at including representatives of the principal policy and social sectors considered relevant to the centre. The individuals in each sector were selected for their known awareness of or association with the centre. This awareness or association was confirmed in preliminary email invitations to be interviewed. An attempt was made to include a representative of the tourism sector but, after several unsuccessful attempts to secure a commitment from a representative of the national tourism authority (which also manages the city tourism office), interviews went ahead with five rather than the targeted six interviewees.

The focus group with 'actors' associated with the centre took several attempts to arrange and only went ahead after two late cancellations due to late withdrawals of participants. It had been intended to include senior academic and business figures associated with the centre through membership of the centre's board but it not prove possible to secure their commitment to

participate. The difficulty in arranging the focus group is reflected in the fact that it took place at the end of April, while other field work was done in mid-to-late March. It went ahead with five participants, of whom four are directly employed by the centre.

Results

Results 1. Survey of visitors to the centre

Data collected 7-13 March 2012

Visitors to the centre were approached when exiting the exhibition. It was attempted to invite all visitors leaving to participate. The exclusion criteria were: living permanently outside the country or being under 16 years of age. 219 respondents filled in a questionnaire, 13 needed to be excluded (3 were under 16 years; 6 lived permanently outside the country; 3 omitted essential information, 1 worked in the centre), Valid answers n=206.

The questionnaire used was provided by the PLACES toolkit, and adapted to the centre. Questions on general attitudes to science were left out as visitors to the centre are generally interested in science and technology.

The questionnaire was read out to participants, and their answers recorded in 30 cases. In 176 cases, respondents were handed a paper copy to fill in. Missing values were included (to gauge response rates for each question).

The centre has a very popular café and stages events such as meetings and lectures that are unrelated to the ongoing exhibition, so many visitors had not spent any time looking at the exhibition.

The centre is part of a university campus, and the people who frequent it are not representative of the population as a whole (e.g. there was a high number of PhDs amongst visitors). The sample for this questionnaire aimed to be representative of the population visiting the centre.

On weekdays about 42 people were asked per hour per interviewer to participate. 25 people asked were in the building for purposes other than the exhibition, 12 refused –nearly all of them gave 'no time' as a reason, the others gave no reason–, and about 5 participated.

At the weekend about 31 people were asked per hour per interviewer. 10 people asked were in the building for purposes other than the exhibition, 10 refused (either no reason was given or the reason was again "no time") and about 9 participated.

There were approximately as many women as men among the people who declined to participate.

The most difficult group to reach were people with small children, as parents or guardians often feel they have no time to fill in a questionnaire. A further problem were that many people when exiting the exhibition wore headphones or spoke into mobile phones, and could not be asked to participate.

Summary of findings

Respondents' profile

Most respondents were young, well-educated, worked in professional careers and lived in the city or surrounding areas.

Nearly a third (30.6%) was between 25 and 34 years old, and about a quarter (24.3%) were between 16-24 years old, and nearly 19% between 35-44 years old. More than 65% were university educated, and over 40% were professionals. 86% of respondents lived in the city or within commuter distance of it.

Immediate Impact

The centre has a high number of repeat visitors (66%); for about a third (34%), this visit was their first visit.

Most people (59.7%) found the visit of the centre more interesting than visiting an art centre or another cultural venue. Only 11.2% find it a little or a lot less interesting. For about a third (29.1%) it was as interesting.

Comparing their learning about science in the centre to learning in school, 80.6% reported that they found the centre a little or a lot more interesting. However, 8.2% found it a little or a lot less interesting.

Regarding confidence, the group that had gotten a little more or a lot more confident (48.5%) is comparable to the group which felt neither more nor less confident (46.3%).

Science Citizenship

More than half of the respondents reported that they followed up the exhibition in some way (50.8%). Most of these looked up information, nearly all of them on the internet. About a quarter of the citizens interviewed (24.6%), discussed issues of the exhibition with other people. Influences also led to activity, such as transferring the learning in the family, artwork or crafts or influence on teaching or research.

Impact on consumer behaviour

The majority of people said that their last exhibition visit had not led to the purchase of any related products (74.3%). However, 14% reported that they had bought products related to the exhibition.

In regard to the current exhibition, most people thought it would influence their behaviour with regards to food labels (54.3%), and 44.7% though it would not influence the attention they pay to food labels (many of the respondents added that they already paid a lot of attention).

More than 10 percent (10.7%) believed they will start or stop buying particular food products (the nature of the exhibition was such that it encouraged visitors to try new things rather than educating about healthy foods). Of these, most were inspired to try new foods. Two respondents changed their attitude to meat, and three became aware of quality issues in foods.

Science city impact and awareness

About one third (32%) knew that the city is designated a city of science and has officially declared itself as such; about two thirds were unaware (65%).

Of the people that knew, most had learned about it from a newspaper, on the internet, or at school/college/university, from friends/family or on TV.

Only 12.1% knew of other events for the public as part of the city of science, 80.6% thought they had not heard about other events.

A variety of definitions have been brought forward (for a summary see question 13. in the results section in Annexe 1, or full answers in Annexe 2).

Respondents believed it is important for the city to be a city of science. 80.5% thought that it would be very or fairly important for the city's economic growth to be a city of science, and similarly, 81.6% thought it would be fairly or very important for its image.

The centre

The centre is seen as an important venue for the city. 78.1% believed that the centre plays an important part in the cultural life of the city, 16.5% neither agreed nor disagreed and 4.9% disagree.

56.3% thought the centre plays an important part in the economic development of the city, and about a third (34%) neither agreed nor disagreed, 8.7% disagreed.

64.6% thought that the centre was an important symbol of the city, about a quarter (25.2%) neither agreed nor disagreed, and nearly 10% disagreed.

In regard to the importance of the centre as a tourist attraction, respondents were less convinced. 31.6% thought the centre was one of the main tourist attractions in the city, about a third neither agreed nor disagreed, and a third disagreed or strongly disagreed.

More detailed presentation of the survey results can be found in Annexe 1 and Annexe 2 below.

Results 2: Interviews with stakeholders of the centre

Interviewees were selected to represent distinct sectors with a stake in the city's development, involvement or interest in science communication activities and an awareness of the centre's activities. Interviewees were also selected for their status to speak not just for themselves as individuals: all interviewees were heads of departments or units within their organizations.

Interviewees were:

- Journalist in a local newspaper (media)

- Worker at the city council (local government)

- Worker at the chamber of commerce (business)

- Worker at a science foundation (scientific research)

- Worker at a government department (national government)

Interviews were conducted between the 12th and the 26th of March 2012. The interviews with 1-4 were face-to-face and lasted 25-40 minutes. The interview with 5 was conducted by telephone and lasted 15 minutes.

Responses to the questions are grouped below under the four themes indicated in the PLACES guide for semi-structured interviews. Individual responses are identified by the numbers above, i.e. IV1, IV2, etc.

Some points in common or largely shared between the five interviews and interviewees are worth noting:

- Questions on science and technology culture tended to produce –initially at least– responses on the conduct and organisation of science and technology rather than on the public culture of science and technology; this indicates that terms like "scientific culture" are weakly established in public discourse

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- Questions in which the centre was mentioned as a prompt to interviewees tended to produce strongly positive responses on the originality of the centre's approach, the value and attractiveness of its activities and the impact of those activities on the public, particularly young adults

- Interviewees could not identify instances of researchers becoming more involved in decision-making processes through science communication or related activities

- Interviewees could think of very few instances of research centres or high-technology businesses opening their doors to the public; this may indicate that these sectors tend not to think of their contribution to science and technology culture as one of inviting people in

- Interviewees found it difficult –even with prompting– to think of answers to questions on possible financial or other policy measures to promote science and technology culture and on economic impacts of science communication activities; this indicates that discussion of scientific culture in policy and economic terms is also weakly established

- In responding to questions on the future, but also spontaneously in discussing current activities, interviewees were optimistic that the public culture of science and technology will strengthen and that the interest young people show in science and the respect they have for it will have a significant impact on the city and country

Questions on policy: summary of responses

The opening question on the 'added-value' of science and technology culture defined in local terms led to reflections on the ways in which a national aspiration could be made more immediate, meaningful and accessible.

If we're to be viewed as a country of innovation and innovators we need a national innovation plan. But we also need local innovation plans that bring together the right resources, public and private, third level and volunteer, to create momentum. That is something the local authorities could very usefully do (IV5).

If science and technology culture is defined in city terms and the city authority is involved, said another interviewee, it may

bring different people together, not just the purely scientific and academic community, allow science and economic development issues to be joined more and move activities outside the university walls to involve people in the street (IV2).

From the point of view of the research communities it was argued that cities have needs and, as the emphasis increases on scientific research meeting social needs, a stronger local science and technology culture would be the basis of a clearer expression of a city's research needs, e.g. in relation to water resources, waste management and transport (IV4).

The interviewee from local government stated that there was already evidence of research institutions seeking to take on research on issues relevant to the city but though that the scientific community needed to make more effort to communicate their work to public bodies (IV2).

On the role of local government in fostering science and technology culture, it was noted by one interviewee that local government has contributed to development of artistic culture, e.g. through funding of arts centres, funding scheme for public art and through appointment of arts officers, but hardly at all to promoting science culture. He thought that local government could contribute to science awareness and education by appointing science culture officers, similar to the existing arts officers, engaging with schools and local groups to bring science into the everyday culture and through co-operation with high-technology businesses on science communication initiatives (IV1).

An 'open data' initiative of the city authority was cited as an example of productive partnership between different sectors. This initiative was seen as very important contribution that has a long lead time but will deliver benefits to the city itself (IV4) and as a means for the city government to make citizens aware that "there is a lot of science and engineering in city authority activities around water management, waste management and flood prevention" (IV2).

The local authorities of the city region have been involved in the development of an initiative to link businesses, research and higher education institutions and the local authorities. Its establishment means that the inputs of these stakeholders may be considered in the formation of local government decisions (IV3) and that there is a voice for science in the room in discussions around issues in development of the city (IV2).

The local authorities also promote and support the annual city innovation week, which may be seen as "a clever way to engage public with science without using that label" (IV3), but interviewees did not mention this initiative spontaneously or forcibly as a significant contribution by the local authorities to fostering science and technology culture.

Researchers were not thought to be much involved in public policy processes or in public discussion of the implications of their own work but, in the view of one interviewee "need to understand that it is in their own interest to be more engaged" (IV4).

Local citizens were also not thought to be actively seeking better access to scientific information or to policy discussion on science-related public issues but, from the perspective of local government, it was noted that the local authorities find the public more informed and active when interacting with them on science-related issues (IV2). However, that interest may have declined due to preoccupation with the state of the economy.

Businesses are not as active as they might be in supporting and undertaking science communication activities with other partners, in the view of one interviewee (IV4). It was observed that businesses that are involved in partnerships to promote science culture through schools tend to do this on an individual basis, keeping these bilateral relations to themselves (IV3) but also that it will be a mark of success "when businesses no longer feel the need to brand it as their own… there is some evidence that businesses are beginning to take a more long-term view" (IV4).

On specific partnerships, it was mentioned that there are possibilities for media businesses and research groups to co-operate on analysis and presentation of complex data and improve science communication through media (IV1).

The business sector representative noted that their plan for the city as a knowledge region (2008) included a call for a science museum. The centre has taken up this mission and its efforts are reaching people who are not generally science-focused in their work (IV3). Other interviewees observed that the public was becoming increasingly involved in discussion of topics of the centre exhibits, and that participation in activities there has increased the visibility of some scientists who are good communicators and attractive to the media, but not specifically in relation to policy processes (IV1).

As one of the few concrete proposals in response to a question on policies to foster science and technology culture, one interviewee suggested there should be more such centres "at convenient locations around the city, where people can meet" (IV4).

Questions on quality of life: summary of responses

The impacts of science communication activities at the centre on the media were noted by several interviewees. The centre was seen as "encouraging media to be more interested in science through imaginative ways of raising the media's interest" (IV4).

It was noted that not only elite media but also popular media were becoming more interested in science topics through the centre's arts –and entertainment– led approach (IV5). But while it was stated that "media

businesses in general are becoming more aware of the possibilities of science stories" (IV1) and that there was "far more coverage of science and innovation in media, including in business sections, and inclusion of science elements in general media" (IV2), one interviewee said he did not think that media coverage of science has increased significantly (IV3).

The discussion of exhibits at the centre through social media was mentioned by one interviewee and (IV5) the impacts on social media users by another:

The most enduring impacts of the centre and similar science communication activities may be on younger people, particularly those who can be regarded as "digital natives", but it is hard to know what those impacts will be (IV1).

Several interviewees noted the particular appeal of the centre's science communication activities to young adults as 'cool', for example:

The centre has attracted a new audience who find it hip and trendy. Their exhibitions and talks make people think about things in different ways. It's still a niche audience but its focus is right. Every exhibition contains surprises (IV2).

One interviewee underlined the ability of the centre's unusual approaches to attract new audiences but also to draw attention to the creativity and the challenge to orthodoxy in good science (IV4):

If we can harness for science the creativity that appears to be inherent in local people we could become a very significant player in science for a small country (IV4).

The centre and its exhibitions were seen as contributing to the city's cultural identity, also because of its association with a university doing important research, e.g. in genetics (IV1). The centre is strongly associated with the programme for the city of science and one interviewee noted:

The city was always a city of science and produced many great scientists. The city of science label gives us an opportunity to show that this is a country of innovators not just in information technology but in food science, biotechnology, pharmaceuticals, energy technologies, etc. (IV5)

The historical perspective was mentioned by others who said that the city of science was "partly about reclaiming history" (IV3) and that the city and the country have "a story to tell about our scientific activity and heritage" (IV4).

Interviewees were generally not confident that the city's citizens were much aware of belonging to a knowledge society or innovation society or of the implications of that:

The public is not strongly engaged with the knowledge society. One big success story, e.g. a large pay-back on an invention, could change that (IV4).

The public would find it difficult to define what the knowledge society means and a very small proportion would link the concept strongly with scientific research (IV3).

Some may wonder who the jobs will be for in this knowledge economy. When I was working in a community, meeting many different people from day to day, I did not hear people talking about this (IV2).

However, it was also stated that the generation of jobs in knowledge economy sectors was making the public increasingly aware of the knowledge society (IV5).

<u>Questions on social and economic impacts: summary of responses</u>

Most of these questions produced minimal or no answers. Interviewees could not think of impacts of science communication activities beyond those directly of the centre. It was suggested that the centre could generate economic activity by selling its services and replicating its activities elsewhere on a smaller scale (IV4) or becoming an investor or entrepreneur in activities initiated by others (IV1).

The centre's success in attracting sponsorship was noted by all interviewees. The attraction of sponsorship to promote the centre idea internationally was also mentioned by one interviewee (IV5).

On financial support measures to promote science and technology culture one of the few answers was a statement that

We have to incentivise people to take risks in this field. We also need to make communication part of the researcher's day job. Publicly funded researchers should be assessed on their communication as well as on their scientific and financial performance (IV4).

There were several different views on the impacts of the centre's science communication activities on tourism, one interviewee (IV5) stating that they were already having an impact, another questioning whether the age-cohort that the centre targets were likely to come to the city for long stays (IV3), but others insisting that science tourism should be promoted by getting science into the 'culture' for which many tourists come to the country (IV4) or drawing attention to the potential to promote on-the-street science activities that would attract people to the city (IV2).

Questions on education: summary of responses

Interviewees drew on their own experience as parents or their relationships with teachers and schools in responding to these questions, almost always in an optimistic spirit. Questions seeking information on specific educational initiatives produced few or no material responses. However, several interviewees drew attention to the interest of younger children in science and emphasised the need to provide more for this at primary school. One interviewee stated:

There has to be strong engagement at that early, formative stage. We need to inculcate a culture of engagement with the sciences from the earliest possible opportunity (IV5).

Interviewees generally thought that primary and secondary schools were undertaking more visits to science-related institutions, but they saw the centre, in particular, as a place that schools were actively interested in visiting.

One interviewee spoke of the rising interest in science among school students, as evidenced in the increasing number and quality of submissions for one exhibition (IV1). This was seen also as evidence of the very big potential for promoting science and technology culture in this age cohort:

We had a group of transition year [approx 15 years of age] students visiting us recently and they are extraordinarily clued-in and interested. When they're interested, they're really, really interested and engaged and their understanding of science, of computers and of the world around them is extraordinary. And it's one of the things I was very keen to do with a newspaper science supplement for young people, to consider not just what would I have been interested in at 16 but also how do you communicate with this group. You certainly don't talk down to them because they are a really intelligent, really thoughtful and interested demographic…They're hungry for information and if you give them the opportunity they really go with it and they come back full of ideas (IV1)

Another interviewed cited evidence from a producer of children's programming in national television of young people's strong interest in science. The science content of afternoon programmes is being increased and it was thought that this would prompt parents and teachers to demand more such content in schools (IV4).

An initiative to promote computer programming skills among young people was praised repeatedly by one interviewee (IV1) and mentioned by another (IV2) as an example of engaging children actively with science and technology.

One interviewee saw evidence not just of increased interest but also of greater respect for science among young people:

We need to explain better why science is important or we risk going the way of [country named] where the ministry of science was closed and the budget cut by 40%. The bottom-up way we are trying to do this, through children, is the right way and more sustainable (IV4).

Results 3. Focus group of staff and collaborator of the centre

Held on 27 April 2012

Participants comprised staff from the centre and a food scientist who had worked with the centre on one exhibition.

Participants were:

- JC, European projects at the centre

- LS, Programme manager at the centre

- IB, Events and community manager at the centre

- MP, Chief researcher at the centre

- GQ, Operations manager at a national university

Impact on researchers

According to focus group participants, the greatest impact on researchers working with the centre was getting feedback from the responses to exhibits. GQ was "amazed" by the level of interest from visitors. The centre staff agreed that this was a common response from researchers, who were generally quite modest about their work and surprised that anybody outside of their field would find it interesting.

GQ concluded from her experience of one exhibition that "people are hungry for this", that there exists a large public appetite for engagement. She was also aware of the recognition and importance that funders assigned to dissemination. Another impact on researchers that worked with the centre was the networking that takes place there, both informally in the café and formally with structures like a group, which LS described as the "Brains Trust of the centre". The group's meetings are an opportunity for researchers from different fields to meet and collaborate; LS gave the example of a zoologist and an architect who are getting together on a joint project.

Participants in the focus group also described the impacts that taking part in the centre exhibits and events could have for scientists in their research work. For example, an exhibition held in the centre in March 2011, was used by a professor of psychology in a college to gather preliminary data in support of a

funding proposal. The project involved gathering memories from 6.000 visitors to the centre. This work and the publicity behind it helped the researcher to secure funding from a health research board.

Another example of funding obtained through participation in the centre came from an exhibition about the future of water. Some researchers working on a water project for Africa had used all their funding and the centre suggested that they crowd-source funding. Although the researchers were initially sceptical, they raised 24.000€ which was enough to complete their Africa project.

Participants agreed that some impacts for researchers were long-term and not immediately obvious during an exhibition. For example, researchers involved in an exhibition about the science of desire, were presenting their results in another city of the country a year later.

Stimulating debate

Staff in the centre does not see their role as one of stimulating public debate, rather they see themselves and the centre as enabling conversations. They maintained that by presenting two sides in a formal debate and "dumping all this information and argument onto people", visitors were switched off.

They see the centre instead as somewhere people could come to be intrigued and made curious. IB, who is responsible for organising events, recounted how formal debates contrasted with events oriented to open conversation:

I'd say that we've had some fantastic fights when we've had events that weren't debates, and when we've had events set up as debates with two opposing sides then there's been nothing, no interaction or conversation.

IB maintains that the role of the centre is to present provocative scenarios and see what happens. He gave the example of serving toasted ants to visitors at an exhibition; this caused visitors to question whether the species they were eating were endangered and how should they make decisions about which species to eat.

This approach of "having a conversation" is characteristic of the centre. Exhibits are designed with low signage, meaning that visitors have high interaction with the mediators. The aim of the centre is to create an experience for visitors rather than have them listen to a didactic lecture.

<u>Staff</u>

The centre staff in the focus group almost all had science backgrounds, and when asked if their work contributed to their understanding of how scientists developed and used their expertise, they responded that it had not, as they knew about this already. The exception to this was IB who does not have a science background. He stated that he had learned a lot about the logistics of science and that "science is not always neat, it doesn't always work the way you expect it to".

Staff working at the centre also has a culture of acceptance of failure. They try out many kinds of ideas to see if they work. Some don't, but this is treated as a learning process:

The science centre is an experiment in and of itself, and being an experiment, it allows you to fail (LS).

Such failure is treated in a very light manner. Staff often joke among themselves that they would like to bring out an annual report on failures.

<u>Schools</u>

The centre does not specifically develop exhibits for school groups and does not take the school curriculum into account when designing exhibits. Many schools bring classes to visit the centre, but staff said they "would prefer if the school students came in with friends or with their parents rather than as part of a school group".

The centre staffs does not want the young people to associate the centre with school, as if they did so, they would feel almost disempowered, and "stop going to it as soon as they're allowed".

However, JC remarked that school groups are guided around exhibits by mediators, who are university students and can act almost as peers to the school students, and that this method works well. Also, the centre runs clubs where school students learn to code and develop programmes.

JC described one big success with school students: school students involved in the preparation of the forthcoming exhibition. The students really entered into the spirit of the project and have gone back to their schools and are setting up their own exhibition. They have taken ownership of the ideas rather than going to the centre to take in information only.

Students

In relation to older, university students, focus group participants remarked on the impact on students who volunteered to be mediators at the centre. The participants praised the mediators working there, and observed that they had feedback from a recruitment agency which specialises in science and technology jobs to say that the agency had noticed a "confidence difference" in graduates who had worked as mediators in the centre.

LS gave the example of one particular student, who had left her science course to go travelling and then on her return had worked as a mediator in the centre. The centre reignited her interest in science and she has since completed her science degree and is undertaking a PhD.

More formally, the centre is involved a college broad curriculum initiative through the cross-disciplinary undergraduate course which involves working on the boundaries of art and science, engineering and developing new ideas where these disciplines meet.

College, city and community

Focus group participants described the main impact of the centre on the college as opening up the campus to the local community and the city. What had been "a big wall and a car park" became a glass shop-front with an entrance and a bright lively café described by IB as "non-intimidating".

As well as physically opening the campus, the centre has also opened up the research carried out in the college and it often uses the centre as a venue for events and presentations of its work.

Asked how the centre had impacted on the city, participants responded that it had "made its mark" but that "not everyone knows about it". GQ described it as a niche area that not everyone would be interested in, but LS also spoke about how the city council was very much involved in the forthcoming events.

As for international impact, the centre receives two to three requests every week from universities and city councils who want to come to the city to see it.

Personnel in this case study

The case study research was led by an individual contractor in the impact assessment (WP6) team on the PLACES project. He is a former senior lecturer in science communication (retired 2010) at the local university. He co-founded the Masters in science communication at the local university in 1996 and remains active in science communication teaching and research networks as a

member of the scientific committee of the PCST (Public Communication of Science and Technology) network, contributor to several recently published edited books on science communication and co-editor of a book on public communication of science and technology. In this case study, he conducted the stakeholder interviews.

Research assistants on this case study were DS (visitor survey) and YC (actor focus group), both of whom are engaged in studies for PhD on science communication at the local university. DS's research concerns evaluation of the outreach activities of a scientific research centre and YC's is on science programmes on television. DS holds an MSc in Science Communication from another university, and YC holds an MSc in Science Communication from the local university.

Conclusions

The centre in its four years of existence has had a significant impact on the scientific communities, policy-makers and the public in the city and beyond. The centre represents a distinctive type of science centre that has attracted new media attention for science-related events and issues. The impacts of the centre's exhibitions and events have been extended through social media conversations and sharing.

The expected announcement in 2012 of new or remodelled science centres in several cities around the world, based on partnerships with the centre already demonstrates the international appeal of the model it has developed. But on the basis of this case study we recommend that the centre's approach, including, for example, its methods for development and curation of exhibitions, for collaborations between researchers and curators, for partnerships with companies and public authorities, for facilitating conversation-oriented events and for employing student volunteers, be further disseminated as examples of good practice through networks of science centres and science cities.

Recommendations

Visitor survey (A2)

To fill in the visitor survey questionnaire face-to-face, even in the shortened version, took a minimum of 6 minutes, but typically 10-15 minutes as respondents sought to explain and justify their answers. Completing the self-administered paper version took a minimum of 3½ minutes. It took approximately 33 person-hours to complete 219 questionnaires.

Most of the questionnaires were filled in with very few missing answers. 13 out of 219 needed to be excluded (about 6%).

The questionnaire would benefit in further development when the answer options are varied. Often the positive options are read out first, and people answer before all options are read out. This will possibly bias the interviewee. The option of 'strongly disagree' is hardly used, which would indicate that the options are not evenly weighted.

Another difficulty is in the attempt to note verbatim the answer to respondents' definition of a city of science, as people elaborate extensively when asked, and speak very quickly.

The question of ethnicity is not asked often in the country, and it sometimes turned out to be rather sensitive. One person was very offended by the question, as from the juxtaposition of science and ethnicity, he induced that the questionnaire investigated differences in understanding of science. He commented that there was an assumption by Westerners that other people do not understand science. He also said that the only people who were interested in ethnicity were in Nazi Germany with disastrous results. Other answers included religion or specific origin.

Some people had trouble reading the paper version, and it is recommended that larger fonts are used.

One problem with the self-administered questionnaire is that questions asking about the city of science can only be answered if respondents have heard about it as it cannot be briefly explained as was suggested in the toolkit. The analysis of answers to the open question ('in your own words, what do you understand a city of science to be?') is very time-consuming.

Semi-structured interview (B1)

The proposed questions were reduced in number for these interviews in order to ensure that interviews did not go beyond 40 minutes. The initial aim was to keep interviews to 30 minutes on the basis that this is the maximum that it is reasonable to ask people to give to an exercise of this kind.

In a semi-structured interview, it is also important to be able to follow leads from the interviewees and this potentially extends the time. It is strongly recommended that the number of questions in the interview guide be reduced, and that questions be merged, e.g. 1C and 1D, with 'researchers' and 'public' as variants/examples in the same question; 3A, 3C, 3D, 3E, with revenue-generation, tourism, jobs and infrastructure as variants/examples; 4A, 4B, 4C 4D, with their particular topics as variants/examples.

In two cases, however, sub-questions might be better taken as separate main questions, e.g. the question on 'innovation society' in 2C – a feeling of belonging to this is not only a function of science communication activities; also in 2A, the question on the media's attentiveness to science and technology issues –this is also not only a function of science communication activities.

It is further recommended that users of this instrument be advised to consider from their own local knowledge which questions have no local relevance and should be excluded. In this case study, questions 3A, 3B, 3D, 3F produced no useable responses.

It is also further recommended that users of this instrument be advised to consider from their own local knowledge which questions have to be rephrased. In this case study, the first sub-question in 2C was rephrased as referring to 'knowledge society / economy'.

Focus group guide (C2)

The greatest difficulty encountered in conducting this focus group was in scheduling it for a time convenient to all participants. Also, due to their busy schedules, it was not possible to get centre board members to participate as originally intended. As observed in the Toolkit, in most cases it is easier to make individual appointments with several actors than a joint appointment with a group. For this reason, it is recommended that C1: Semi-structured interviews with relevant actors are used in situations where it appears early that it will be difficult to convene a focus group.

The Toolkit proposes that focus groups be two hours long. This was reduced to one hour as it is recommended that this is the maximum amount of time that it is reasonable to ask people to give to an exercise of this kind.

The Toolkit proposes that at the beginning of the focus group, each participant is given about five minutes to talk about his/her response and the respective institution's response to participating in the case. With eight participants, each talking for five minutes, this would take forty minutes. It is recommended that these opening statements be simply an introduction and a brief description of the participant's role in the case.

References

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