



# PLACES

Platform of Local Authorities and  
Communicators Engaged in Science

**Modules used: A1, A2, B1, C1**

**Science Centre**

**2012**

This is a standardised version of the original case analysis number 23. Specific names and locations have been substituted from the original document number 23 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](mailto:occ@upf.edu).

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## **Abstract**

The main purpose of this study is to investigate the effects of the activity of science communicators in a science centre. In addition to permanent exhibitions on technical culture, the museum, in cooperation with research units from several faculties, organises workshops, demonstration experiments and lectures from different fields of natural and technical sciences.

The research was conducted using pre-prepared instruments that were formed within the PLACES project and which included a survey of museum visitors, questions for interviews with visitors, questions for interviews with actors-researchers who collaborate with the museum and questions for interviews with observers/stakeholders. Data were collected in June 2012. Questions for the survey of visitors were summed up in two research questions: what is the effect of the visit at the individual level and what does the technical museum represent for the local community and the wider region.

The results indicate positive effects at both levels. People who visit the museum more often tend to be more critical of the effects achieved. The actors also gave a positive assessment of their cooperation with the museum. They answered two research questions: the motives for cooperation and the impact of this cooperation on their research work. The original motive of all participants was to increase recognition of their institutions and attract enough students, which later developed into more diverse efforts to popularize science and technology. The impact of these activities on their work is recognised as weak, especially in terms of improved communication skills. The answers provided by observers/stakeholders referred to four research questions: what is the general impact of SCIPs on society and economy, what is the impact of SCIPs on the quality of life, what are their economic effects and what impact do they have on education. The answers provided by this group are much more critical of SCIPs, but also offer certain solutions: to exploit the potential offered by the city and the region for the development of the city towards a centre for innovative technologies and culture, which would result in economic benefits and a higher quality of life. This also relates to a different attitude of the media towards science and technology, to education, which should move beyond school to a greater extent, an increased openness of research institutions, the training of researchers for communication with the public, development of funding and other.

# **Introduction**

## **General introduction**

The main purpose of the study is to attempt to evaluate or to measure the impact of science communicators after all efforts that have been invested in this sector. The process of evaluation is a logical step toward improvement and advancement of this area of public efforts. This is an attempt to find out more about the impact that a visit to a science museum has on visitors, the impact that activities in science museums have on actors-researchers, the effect of a regional policy aimed at promoting science and technology and in some aspects also about the possible outcomes of these efforts in the future.

## **Particular research questions**

In this case study we focused on the level of science centres and museums and their potential impacts on three dimensions: the public, the political sphere and the actors. A science centre was selected for the study. The specific research questions addressed in the study focused both on the impact that this museum directly has on visitors and on the less noticeable effects or more subtle and long term impacts that those and similar SCIP activities have on the broader culture and the society, as well as on the effects of SCIP activities on the actors, i.e. the people who were directly involved in the preparation and organization of activities.

## **Specific research questions**

Specific research questions were already partly defined in the common toolkit – a survey for visitors and questions for semi-structured interviews with visitors, observers/stakeholders and actors.

Based on the questions for visitors (survey –module A2 and interview–module A1) the following research questions were formed:

- What is the impact of the visit at the personal level (motivation, learning, knowledge)?
- What is the impact on the wider community (culture, business, economy)?
- How does it affect the perception of science?

The answers obtained from interviews with observers/stakeholders (module B1) were grouped into the following questions:

- What is the general impact of SCIPs on the society and the economy?

- What is the impact of SCIPs on the quality of life?
- What are their economic effects?
- What is the impact of SCIPs on education?

The answers obtained from interviews with actors (module C1) were grouped into the following questions:

- What was the motive or interest for cooperation?
- What impact did this cooperation have on the actors (feedback)?

### **Rationale for case selection**

The science centre was established with the purpose of recording, collecting, managing, safekeeping, preserving, communicating and protecting the technical heritage relevant for the development of crafts and industry in the country. Due to a lack of exhibition and depot premises, special technical collections were established in several places around the country, which over the years became independent. The first science centre collections in the city that focused on forestry and hunting were opened in 1953. Today, more than 6 000 square metres of exhibition premises feature permanent collections showcasing the history of agriculture, traffic, forestry, carpentry, hunting, fishing, textiles, printing and electrical engineering. In addition to the museum, there are other dislocated units in the region.

The castle that now houses the museum is located in a preserved natural environment 20 kilometres to the southwest of the city. Its origin dates back to the 14<sup>th</sup> century, to the establishment of a monastery. In 1782, the dissolution of monasteries was decreed. The property was turned over to the state-governed religious foundation. In 1826, a merchant and industrialist acquired the castle and its estate. He and his successors used it as a manor house whose characteristics remain to this day. The estate and the manor house were nationalised after World War II. Soon after its establishment in 1951 the castle became the home of the science centre (reference 1).

The science centre is a good example of a museum that developed from traditional forms of presentation (exhibition of permanent collections) into a contemporary communicator of history, technology and science. In addition to permanent collections, nowadays the museum showcases temporary exhibitions, organises a variety of events, demonstrations, lectures, workshops, offers guided tours and holds a special events programme for schools. The museum addresses the wider public and has about 45 000 to 50 000 visitors a year. A large share of these visitors goes to organised school trips.

The museum participates in several European projects, such as the Open PLACES Platform, and is a member of a few international associations.

It is largely funded by the Ministry of Education, Science, Culture and Sport, and to a lesser extent also with own funds.

## **Methods**

### **Methods and modules**

This case study focuses on the level of science centres and museums and their impacts on three dimensions: on the public, on the political sphere and on the actors involved in the SCIPs. We used a combination of quantitative methodologies (basic statistics with descriptive analysis) used when we elaborated data from the survey of visitors, and the qualitative approach used when the data from interviews were analysed and summarized. For each group (dimension and level) of the study a sample-specific toolkit was prepared. For this case study we used:

- Module A1: semi-structured interviews with visitors
- Module A2: survey of visitors
- Module B1: semi-structured interviews with observers/stakeholders
- Module C1: semi-structured interviews with relevant actors

(Annex 1, transcriptions)

### **Visitors**

To collect data from visitors through a survey questionnaire and to conduct interviews with them we selected two working days in June and one weekend that coincided with the “museum night”. This day was chosen at the advice of the museum management because it attracts very heterogeneous audiences. In order to obtain as random a sample as possible from groups of visitors, we used the last birthday selection procedure; otherwise, every fifth visitor was asked to complete the survey. Interviews were conducted with: a member of the family who visited the museum (female), a senior visitor (male, pensioner), a young visitor (male) and two middle-aged visitors (one male and one female). None of these visitors refused to participate in the survey or interview. The instruments used were Module A1 and Module A2.

### **Observers/stakeholders**

Selection of the observers/stakeholders to be interviewed and justification

#### Research institution

MC, a PhD researcher at an institute in the city. She is one of the leading world theoretical scientists in the field of liquid crystals. In addition to her research work she works as a lecturer at the faculty of education of the local university in the courses of physics education and science education. The combination of



both activities provides a good insight into the origins of science and in communicating science to both future teachers and the general public. She is distinguished by her clarity of thought and expression, as well as open communication.

#### Society organisation

EK, a PhD that is a chemist by profession, but works as Director of the National Science Foundation. He was one of the first in the country who made it his job to popularize science and communicate it to the public. He was the founder of the National Science Foundation, which, in addition to other activities, also organises the annual national science festival. He is an active publicist and a member of professional international associations.

#### Culture industry

BP, director of the city museum, under whose leadership the museum developed into a leading institution of this kind in the city. Before his appointment as director, he was employed by the municipality in the Secretariat for Culture. He is an expert on, and creator of, the cultural policy and an advocate and promoter of openness, cooperation and networking between different social subsystems (art-science, art-sports and education-art).

#### Media

SD, a PhD that is a physicist and a philosopher by education. His background in both disciplines, especially in philosophy of science and new information technologies, contributed to his becoming a leading representative of the civil society in the popularization of science and communication between science and the public. He is the founder of the website and publishing house that is the newspaper for the interpretation of science, as well as a translator and publicist.

#### Regional authorities and administration

MF, head of the department for pre-school learning and education, the municipality and a representative of the regional development agency of the urban region.

Instrument B1 was used for interviews with observers/stakeholders.

### **Actors**

#### Educational establishments

Dr. JB, a lecturer of physics at the faculty of education of the local university. In addition to his pedagogical and research activity he dedicates a considerable portion of his free time to working with the young outside the institutional

framework. He has been a successful promoter of physics in the International World Year of Physics, has organised physics competitions and championed the Chain Reaction Experiment (each team prepared their innovation and in the end these innovations were coupled together to form a chain) and collaborates with the science centre in “Days of Physics”.

#### Research institutions

KF, a MSc that works at the faculty of electrical engineering of the local university and is in charge of organising the “Days of electrical engineering” in the science centre. The “Days of electrical engineering” are a week-long event held in May. During this week, the science centre holds interactive experiments, organises workshops and lectures. The faculty of electrical engineering was the first to undertake this collaboration and was later joined by other faculties of the local university.

MK, PhD and professor at the faculty of mechanical engineering of the local university. He is head of the group of lecturers and students who organise the “Days of mechanical engineering” at the science centre. Similarly to the “Days of electrical engineering, the “Days of mechanical engineering” are a week-long event that features lectures, interactive experiments and workshops on mechanical engineering.

#### Scientists

SD, PhD and research staff member at the faculty of electrical engineering in the laboratory for artificial perception, systems and cybernetics. He participates in the “Days of Electrical Engineering” in the centre as an experiment designer and introduces students to the demonstration of experiments.

KS, a PhD and young researcher at the faculty of education of the local university. Her research focuses on high technology and ways to introduce and explain it to the young and the general public. With her research work she is also involved in the promotion of science and communication between science and the public. She participates in the “Days of physics” and in the “Chain Experiment” as a developer and conductor of experiments.

## Results

### Module A2: survey of visitors

Visitors answered the written questionnaire-survey and interview questions. In all, 202 visitors completed the survey. Survey questions were divided between those designed for first-time visitors and those designed for repeat visitors.

For the sake of transparency the graph shows the answers with the same or a similar meaning (e.g. a lot more interesting and a little more interesting, or strongly agree and agree) grouped together, or shows only the first two answers with the highest frequency. A more detailed overview of survey answers is presented in Annex 2, excel spreadsheet.

#### First visit

There were a total of 88 first-time visitors among our respondents. The sample gave a fair picture of respondents in terms of gender; the age of interviewees was between 20 and 70, most of them in the group aged between 20 and 50 years, corresponding to those who visited the museum with their family. The lowest level of education of respondents is secondary school, which is also the largest group among respondents, followed by those with higher education. Visitors came from across the country, most of them from bigger cities. In terms of employment and profession the predominant fields were technical fields and natural sciences, as well paedagogical profiles.

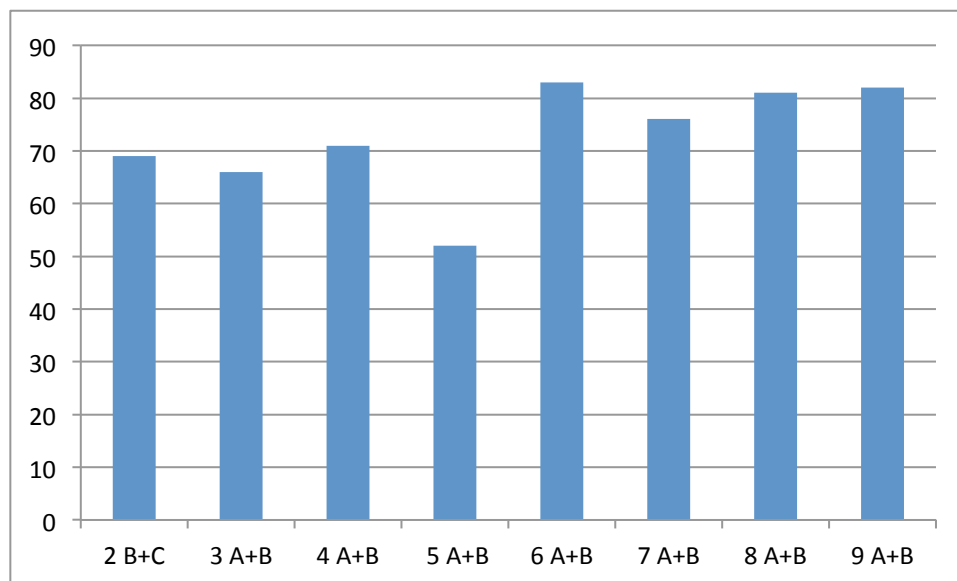
#### Answers to the questions on the impact of the visit at the personal level (motivation, learning, knowledge) for first-time visitors – research question 1

Graph 1 shows the frequency of answers to question 2: who, if anyone, are you with today; question 3: comparison of the visit to the museum with a visit to an art gallery or a cultural event; question 4: comparison of the experience of learning about science in the museum with learning about science at school; question 5: impact on knowledge and confidence.

#### Answers to the questions on the impact on the wider community (culture, business, economy) of first-time visitors – research question 2

Graph 1 shows the frequency of answers to question 6: the role of the museum in the cultural life of the region; question 7: the role of the museum in the economic development of the region; question 8: the role of the museum as an important symbol in the region; question 9: the significance of the museum as a tourist attraction in the region.

Graph 1. (N = 88) frequency of answers to questions 2 B+C, 3 A+B, 4 A+B, 5 A+B, 6 A+B, 7 A+B, 8 A+B, 9 A+B



The answers to question 2 show that a visit to the museum is a social event. The large majority of the visitors came to the museum with their family or friends. This confirms the already known fact that learning or receiving new information and experience in groups is both more interesting and more productive. People do enjoy broadening their horizons. The visit to the technical museum was most often seen as more interesting than visiting an art gallery or a cultural event (question 3). The reason for this could be the structure of visitors and not only the appeal of the museum. A large proportion of the visitors have technical or scientific background and also work in these fields. They are more familiar with the subject and find it worth their while to broaden or refresh their knowledge. Learning about science and technology in the museum compared to learning about it at school was seen as more interesting (question 4). This means that the museum conceived its educational mission very well and in a contemporary manner. In part, these answers can be attributed to a different and more relaxed museum atmosphere, which is characteristic of informal education. With most of the visitors being between 30 and 50 years of age it can also be assumed that they do not have the insight into the new teaching practices in natural sciences and technology in national schools in the past decade. Only a little more than a half said that the visit made them feel more confident discussing scientific and technological issues (question 5). This can be attributed to the fact that first-time visits are usually more informative and less detailed and that the museum information, excluding lectures and special events, are mainly dedicated to increasing the database or learning of facts and less to understanding how science and technology work in a specific historical and social environment.

The answers obtained from the first research question –“What is the impact of the visit at the personal level (motivation, learning, knowledge)?” are positive. Visitors are motivated and their visit to the museum is not a random choice aimed at fun and relaxation, but also at learning. The research showed that, for half of the visitors, one visit was enough to regain confidence in their scientific and technical knowledge.

Questions 6, 7, 8 and 9 gave about 90% of positive answers. Visitors also highly appreciate the significance and role of the science centre for the local and wider cultural environment. The museum is also attributed a significant role in the economic development of the immediate region and is seen both as a tourist attraction and as a distinguished local and regional symbol.

The second research question –“What is the impact on the wider community (culture, business, economy)?” also received positive answers. About 90% of the visitors see the science centre as an important contributor to the cultural, economic and tourist environment in the region and beyond.

#### Repeat visitors' answers

There were a total of 114 repeat visitors among the interviewees. For most, about a half of them, this was a second visit. The sample gave a fair picture of interviewees in terms of gender balance; the age of interviewees was between 20 and 70, most of them in the group aged between 20 and 50 years, corresponding to those who visited the museum with their families. The lowest level of education of interviewees was secondary school; most of the interviewees have completed a higher vocational school. The second most numerous groups were respondents with completed higher education. Visitors came from across the country, most of them from bigger cities. In terms of employment and profession, the predominant fields were technical fields and natural sciences, as well as paedagogical profiles.

#### Answers to the question on the impact of the visit at the personal level (motivation, learning, knowledge) –research question 1

Graph 2 shows the frequency of answers to question 2: who, if anyone, are you with today; question 3: comparison of the visit to the museum with a visit to an art gallery or a cultural event; question 4: comparison of the experience of learning about science in the museum with learning about science at school; question 5: impact on knowledge and confidence; and question 11: Increased interest in the news on S&T.

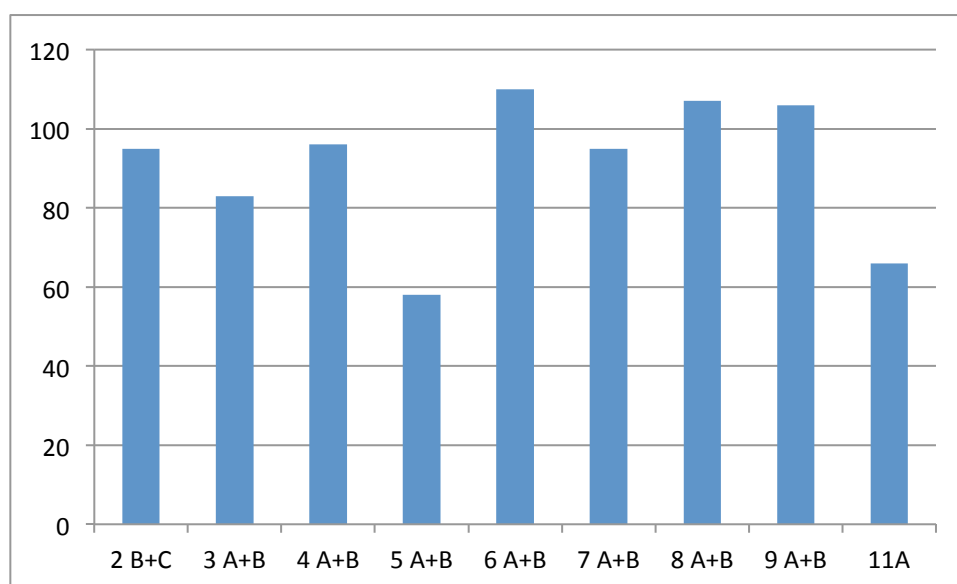
Answers to the question “What is the impact on the wider community (culture, business, economy)?” –research question 2

Graph 2 shows the frequencies of answers to question 6: the role of the museum in the cultural life of the region; question 7: the role of the museum in the economic development of the region; question 8: the role of the museum as an important symbol in the region; question 9: the significance of the museum as a tourist attraction in the region.

Answers to the question on the impact on the perception of science -research question 3

Graph 3 shows the frequencies of answers to question 13: impact of S&T on the standard of living; question 14: the significance of scientific knowledge for everyday life; question 15: the importance of checking findings before they are published; question 16: consideration of public opinion in scientific research; question 17: opinion on whether scientists adjust their findings to suit their sponsors' interests; question 18: opinion on the impact of the visit on their knowledge of scientific activity and the course of the research process.

Graph 2. (N=114) frequency of answers to questions 2 B+C, 3 A+B, 4 A+B, 5 A+B, 6 A+B, 7 A+B, 8 A+B, 9 A+B



The frequencies of answers to the first group of questions are very similar to the answers of first-time visitors. Repeat visitors also saw the visit to the museum as a social event; most often they go to the museum with their family or friends (question 2). They find museums more interesting than art galleries or cultural events (question 3). They also view learning about science in the museum as more interesting than learning about science at school (question 4). They tend to be more critical about their acquired knowledge (question 5). Although there are a little more than 50% positive answers, the

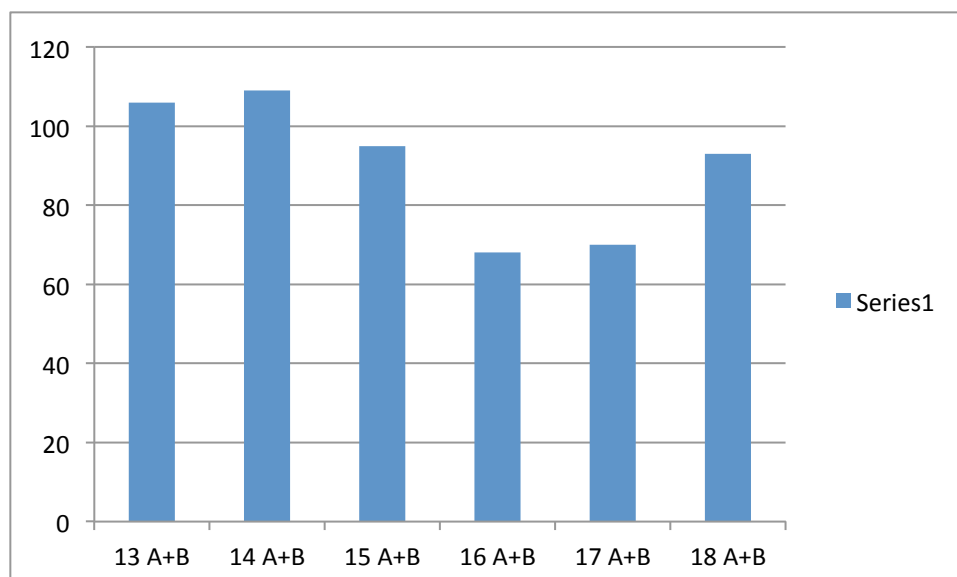
answer with the highest frequency is answering C (neither more nor less confident). Similarly, when describing their interest in S&T (question 11) only a little more than a half found that multiple visits to the museum increased their interest in S&T.

The answers to the first research question –“What is the impact of the visit at the personal level (motivation, learning, knowledge)?” were positive also in repeat visitors. Visitors are motivated and their visit to the museum is not a random choice aimed at fun and relaxation, but also at learning. Slightly more realistic is their assessment on the value of acquired knowledge. Only half of the interviewees agree that they are more confident.

They, too, find that the science centre plays an important part in the cultural life and education in the region and beyond. They see the museum as an important symbol of the scientific and technical heritage and as one of the main tourist attractions. They are less affirmative in their opinion on its impact on the economic development in the local community or region.

The second research question –“What is the impact on the wider community (culture, business, economy)?” received positive answers also from repeat visitors. About 90% of the visitors see the science centre as an important contributor to the cultural and tourist industry in the region and the country, but do not see its economic significance as equally important.

Graph 3. (N=114) frequency of answers to questions 13 A+B, 14 A+B, 15 A+B, 16 A+B, 17 A+B, 18 A+B



Almost all interviewees agree that science and technology make our lives easier, healthier and more comfortable and that it is therefore both important and useful to know about science and technology in everyday life (questions 13 and 14). They also agree in their views of scientific activity. There was a high

level of consent on the importance of checking the findings –understanding the course of the research process (question 15). More provocative questions, such as that on the influence of the public on scientific research (question 16) and on adjusting findings to the sponsors' interests (question 17) gave more diverse answers. Both questions received about a half of the votes of agreement. This indicates visitors' awareness of the conflicts of interests to which scientists are not immune. Most visitors also agree with the positive impact of the visit on the understanding of scientific activity and research process (question 18), but the level of agreement is medium with most interviewees circling answer B (agree).

The answer to research question 3 –“What is the impact on the perception of science” is also positive. With its activity the museum raises awareness of the importance of S&T in everyday life and the significance of the knowledge of natural sciences and technology in today's high-tech society while encouraging a discussion on the dilemmas and byways of modern science.

### **Module A1: semi-structured interviews with visitors**

Answers to the question “Why did you decide to visit the science centre” vary. One family (the interviewee was a young woman) came because of the children. A senior citizen –a pensioner– came because the visit was part of an organised excursion. A middle-aged lady came because she felt nostalgic for school; she had already visited the museum several times. A middle-aged man came with his neighbour, mainly to see the cars. The elderly pensioner came with his grandchildren, at their initiative.

Question: What in particular did you like or dislike?

*“We liked everything, but our son was more enthusiastic about the animals. He is a bit too small for the technical stuff.” (woman with a family).*

*“We thought everything was interesting, from metalwork to bread baking, mill, flour, virtually everything you can see here” (both pensioners).*

*“Cars were the most interesting, that's why I came (a middle-aged man).*

*“I find the development of the bicycle fascinating, I just can't see how they could ride those (a middle-aged woman).*

Question: Where do you see the significance of the technical museum in comparison with similar institutions (e.g. the natural history museum, the house of experiments)?

The collective opinion on the significance of the overview of the history of technology was best expressed by the elderly pensioner:



*"It is important to preserve things the way they used to be and not only in an electronic form, but as hand-made machines. Unless you saw this you could never believe it was possible to make such a thing. I would recommend a visit to school-goers before they decide on their profession, so that more children would go for jobs such as a toolmaker or welder and similar."*

*Another advantage over other institutions was the environment.*

*"The location is special for being situated in a natural and historic environment. The river that runs through it only adds to its charm."*

Question: Are scientific and technological contents and displayed items relevant, appropriate? Could you give an example from your everyday life that you can relate to the science presented here?

It is commonly agreed that the contents are relevant and the visitors commended the variety of different fields represented.

*"The contents are clearly diverse; they present the development of technology in all those fields that made an impact on the development of human kind through technology. I find the exhibits extremely well preserved and representing a certain value for our nation. I was a little surprised by the extent of the complex; I like how it is situated in such an authentic environment. I think it is meant to be exactly where it is, because the facilities themselves are such that they inspire a sort of historic imagination, so to speak."* (middle-aged man)

Although some contents do not have much to do with everyday life, it is precisely that which makes them interesting.

*"Not everything is from everyday life. We went with our son's wishes, but it was really interesting to watch the film about horses, how they shoe them; I think this is one of such things you can't see in everyday life any more"* (a woman with her family).

Interest is often relative to one's profession. The elderly man is a toolmaker by profession.

*"I'm a toolmaker by profession and I've worked with metals almost my whole life. Saws, for example, and everything to do with them, are very interesting for me."*

Visitors were also happy to have renewed their knowledge.

*"Although I've been here before, you still learn something again. There are things you've heard before. You get new experience and learn new details and you just learn more."* (middle-aged man).

For the questions "Do you feel more confident in discussing scientific (technical) issues after your visit to the museum?", "Have you learned enough in order to be more confident?", "Do you feel informed enough to the point where

you feel competent to discuss such issues?”, there are few direct answers, but they are positive.

*“Yes, of course. I've seen many new things, many, although I'm old and have seen a lot.”* (the senior citizen - pensioner)

Some visitors did not learn enough to make them feel more confident about their knowledge.

*“Well, I think there isn't anything all that different, we know these things, but we were able to pass this on to the younger generation in a more accessible way.”*  
(the woman with the family)

Question: In your opinion, how important is science for the development of society? What are the main benefits or problems?

The relationship between science and the development of society is very well presented in the museum.

*“Yes, of course it's important. It continually develops. Even in the past people didn't exactly stall in one place. They started with a small machine, and then they made a bigger one and a little better. People used to make everything by hand. From manual work to the electric motor. It made work easier. Or sawmills and mills, for example.”*  
(senior citizen)

Visitors also mentioned the difference between basic and applied research.

*“I think that's the real driving force of development really. There have been so many contributions, with every finding or invention causing a major revolution. Perhaps in view of today I find it important to stress that this science is not sufficiently applied in everyday life, that is, it's not being used. As if it was an end in itself, science and development. This applicability then, I find it to be something that still needs to be achieved to a greater extent. At least in the country.”* (the woman with the family)

Interviews show that the people come to the museum for a variety of reasons ranging from socialising to reminiscing, often also because of the children. Children are often the reason why families decide to come, although it is the parents who gain the most with the major part of contents being too complex for younger (pre-school and elementary school) children to take in. They are satisfied with the presentation and selection of contents. The themes selected as the most interesting or outstanding were relative to individual preferences. There was an interesting comment that the contents that don't come from everyday life (horseshoeing) are also interesting. Visitors are a bit reluctant when it comes to the question how much they learned through the visit. They stress the importance of refreshing their existing knowledge as opposed to learning something new. The interviewees agree with the statement

on the importance of science for the development of society. One of them illustrated this with the development of different machines and how work practices and lifestyles changed as a result. One of the interviewees stressed the significance of applied research compared to basic research.

#### Repeat visitors' answers.

All three repeat visitors interviewed gave negative answers to the question of whether the visit to the museum encouraged them to become more involved (volunteer) in the promotion of science. Only the lady thought it was worth considering.

The questions on whether the visit boosted their interest in S&T received neutral answers, such as "It's something I'm interested in as it is".

When describing their impressions compared to their expectations before the visit the interviewees agreed they were surprised by the size of the museum, the variety of contents and the beautiful environment. The most fascinating part for all three was the old cars collection. Only one of them was slightly critical, suggesting:

*"Perhaps they could improve the technical part, such as electricity or electronics. That would be interesting."*

Although they are not familiar with similar institutions to be able to compare them or they only know them through their websites, they see the environment as the location's added value.

According to the interviewees, both research questions –"What is the impact of the visit at the personal level (motivation, learning, knowledge)?" and "What is the impact on the wider community (culture, business, economy)?"– received positive answers. The science centre is important both for the visitor's personal development and for the life in, and the development of, the region.

#### **Module B1: semi-structured interviews with observers/stakeholders**

The following observers/stakeholders were interviewed: MC, EK, BP, SD, MF and AC.

The first set of questions refers to the impact of SCIPs on the society and economy. The first question was about the added value of the "culture of science and technology" or "scientific culture".

The understanding and interpretation of the added value to be contributed by the "culture of science and technology" vary considerably. SD believes that in such circumstances where several institutions and events liaise with and complement each other there is bound to occur a synergy of actions

and ideas, interaction between people with similar interests and this in turn has an impact on the development of an innovation society. EK stresses the significance of the public understanding of science, of at least some degree of scientific literacy and understanding that science is a strong development factor. Similarly, MC thinks that the public should understand scientific activity and the significance of basic research. She is critical to the house of experiments which she sees mainly as a link between teaching science at school and applicable science in everyday life. In her view, this has nothing to do with the perception of scientific activity and the purpose of research. According to her, such popularization has no impact on the public understanding and appreciation of the importance of investing in science. BP sees the added value mainly in the collaboration between natural and social sciences, between art and science, urban culture and the culture of the province. This would contribute to a new society with a different understanding of ecology, humanities and natural sciences. MF stresses the importance of two-way communication, which is vital for the “culture of science and technology”, successful communication of researchers with the environment that would increase the level of understanding of scientific activity on one side and responses of the scientific community to the problems and issues of contemporary society on the other side.

Interviewees have more consistent views regarding the role of the local community in development. BP, MF and SD stress the central role of the region and local community's activities.

*“Local and regional communities are the nuclei that generate needs and pursue their satisfaction. Smaller communities are more responsive and more sensitive”. “If the city proclaimed itself a university city, a city of culture and sports, it is high time it became also a science city.”*

All of them agree that at the moment there is still a positive atmosphere in the city regarding this kind of development, supported also by the local authorities. Initiatives come mainly from other civil groups, such as young researchers. Politics is open to suggestions and takes care of the infrastructure where possible.

They are critical of the existing SCIP institutions in the city. SD thinks these institutions should become centres of events and gatherings.

*“The natural history museum has an excellent location, but it's enough if you visit it every three years. It should host additional programs to attract visitors. The house of experiments lacks futuristic appeal. The museum is too dislocated from other events in the city.”*

BP represents museums and similar institutions as mediators, even though in the city they are not all pursuing such development as of yet.

*"Museums and similar institutions are a sort of mediators that can greatly contribute to the popularization of science and stir interest among the young for science and new ways of thinking, so they are of vital importance. This is about collaboration between science, culture, technology, it's about infecting all generations with wonderment at the way we live and how we could tackle certain problems. In this respect they are very important activities that must be supported and become open for schools and the general public. It should be a two-way road, where schools indicate their needs and these institutions indicate the areas where the school curriculum should be complemented, adjusted or opened."*

When asked whether the effects of SCIPs reflect the public voice in science and technology related issues, they all gave a positive answer but left a lot of room for improvement.

MC thinks that it is often the opinion of public figures that counts, without any objective data and sound arguments, so there is often a dilemma among researchers whether they should respond to that or not.

*"The problem is that a certain expert with references will rate equally important in the media as a lay person who works on the basis of common sense. This is like talking to people who speak different languages. A theory is for the public what a hypothesis is for a scientist. For the public, however, hypothesis means the same as what untruth means for the scientist, something that is not based on results. That's why the public don't understand the scientist who says the theory says this and that, or they understand this in the lines of: They don't really know anything, it's just theory."*

SD stresses the role of the media and media personalities who have clear views and also know how to present them, but it is important that they are not involved in the problem themselves. BP thinks SCIPs have a positive impact on the public opinion. He mentions the construction of residential houses and care for the environment. According to him, political segmentation is part of the problem, as it makes it impossible to fairly evaluate whether a project is progressive or not:

*"In this respect science is not enough; political awareness and social engagement are products of the humanities. It's the arguments that are the first to open the doors for natural sciences."*

When asked which development policy would be the most effective in fostering the culture of science and technology, most of the interviewees decided on education. SD stresses the importance of good teachers.

*"Good teachers are the most important, not only the system. The problem is that the best students don't take teaching courses and qualifications. This is to be blamed on the society which fails to take systematic action towards a better school system. It is common knowledge that the money best spent is the money invested in kindergartens and elementary schools. This is where you achieve the most with the least resources. As for the adult population I think our literacy is about average. For anything above*

*average you need the media and publications. The state should support these with tenders (for the popularization of science) like it used to do, but hasn't for a while now. Grants are extremely important for a market as small as ours and this should be in the state's interest as the return it receives is higher than the amount of the money invested."*

BP also points at the vertical of education.

*"I think the school system is very important here, from kindergarten to university, followed by the raising of awareness in the political sphere. Different associations are important, as is the non-government sector that should take care of these translations, for the fluidity of the information flow. It's about a bottom up approach and better engagement of different institutions, from factories to hospitals, whose basic mission is a different one. We should be better informed of what goes on inside these institutions.*

MC focused on a narrower segment of training of researchers for efficient communication with the public. Researchers should be able to communicate their results in an accessible manner. This competence should be part of the promotion system and the responsibility of the university.

MF, EK and AC emphasise integration. Effectiveness of the culture of science and technology is subject to collaboration between the economy (businesses), the public (city) and science (university, institutes) and to multidisciplinary cooperation between technical sciences, natural sciences and social sciences. EK stresses in particular the importance of intergenerational integration and collaboration in science centres. According to him, investments in senior citizens are important because they share their experience with the young.

The second set of questions focuses on the impacts of SCIPs on the quality of life. They include questions on the impact on the public opinion and public participation, the impact on the media and on the identity of the place.

Opinions on the extent to which SCIPs impact on public participation in different debates and activities are divided. AC finds it difficult to assess such impact especially due to the role of the media, who are often the loudest communicators. He adds that despite good communication, the public needs time to learn, a training period.

*"In theory, most researchers in the field agree that the country needs time, a training period to learn to collaborate between the public on one side and decision-makers and policy-makers on the other. This can help build a partnership between social groups and institutions that is based on trust, which is something that can take years to be established. In the future, public participation in decision-making will depend on social dynamics; it is expected that the public will demand to be more included, but these demands are based on the values of self-expression whose origin is in the welfare of the post-industrial society. The economic crisis can shake these foundations. There*

*have been public debates where the public accepted the scientific interpretation and solution, but we also know of the cases where the gap between those involved was larger after the discussion than before.”*

EK sees some improvement in the fact that certain groups affected engage an expert who provides his/her independent opinion, so their decisions are based on more than just common sense.

Interviewees are rather critical about the impact of SCIPs on the media and their quality. MC, SD and BP think that the journalists who cover science in the country lack proper education and should have some additional training. They also agree on the subject of ethics in journalism where bad news is always good news.

*“When you read the newspapers you realize that the journalist does not really know the subject in question. They therefore tend to build on the statements they can understand, and what they understand are the statements from the public.”*

EK thinks the media have a limited interest in science, which is supposed to be due to a small public interest, something which is not true. On the other hand, a number of researchers believe that their work is not suitable or interesting for the general public. Another drawback is the ghettoization of science news, which is never featured on cover pages. SD thinks that researchers also lack the knowledge of how to report their work. He therefore welcomes the activities of the National Science Foundation, where researchers were trained to prepare press releases and learned how to communicate in interviews.

*“The problem is that science in the media often turns into self-praise or complaining about the lack of funds. About 90% of media appearances are about that. What's missing is the desire to motivate the public for a new discovery, a new field of science. Once that changes, the media will follow.”*

Both interviewees agree there has been some progress in this respect and mentioned several good journalists and good practices of facilitating the promotion of science in public.

MF directly responds to the media coverage of the events organized by museums, the House of Experiments, the National Science Foundation and others. He thinks these events are well covered, as well as different civil initiatives with direct public involvement, such as the quality of water, use of pesticides and similar. The question is how much this contributes to the understanding of scientific activity. Such news is usually reported as coverage in the social affairs section or as local news.

The interviewees agree that SCIP activities change the cultural identity of the city.

Administration representatives, MF and AC agree that these activities have a pronounced impact on the identity of the city. These activities have an impact on the citizens' identity, on the culture and the development of the city and tourism. Similar developments have been detected also in the city. BP thinks that more could be done in this respect.

*"The city is doing really well in terms of culture. It is a small city and has therefore plenty of opportunities to become a city of new technologies. The environment is suitable; there is a lot of nature and good access to other European centres, so it's ideally suited for an innovative technological breakthrough. It could become a science centre in the region and if we don't do it, other cities will do it first. Considering its size, relatively small investments could yield great results."*

MC agrees. The current situation in the city has had very good response. It's exactly this kind of events that are so appealing to foreign visitors, but we have reached the limit of our resources. More investments in people and infrastructure are required. She thinks, however, that these activities today are intended more to develop an understanding of phenomena or "scientific literacy" than to foster a sense of identity with a technologically innovative society. EK finds that impacts can be detected only if SCIP activities are integrated into the wider cultural and sports activity.

*"The drawback of this is there is no strong, independent impact. But even this is OK as it shows how science is capable of presenting itself. However, this presentation is outdated and does not go beyond some contemporary communication or performance. The problem is that if science is not presented the way researchers imagine, it will not be scientific."*

The third set of questions deals with social and economic impacts of SCIPs.

*Economic impacts occur also in companies that participate in the promotion of science –if it is in line with the economic mission of the company, of course (EK)*

In addition to direct economic impacts that could be generated through the establishment of young experts' companies and concentrations of innovative and integrative approaches that could attract foreign investors (SD and BP), there are also indirect long-term effects, such as an increased interest in natural sciences, thinks MC. AC is also convinced of the long-term impacts and believes that only knowledge-based innovative societies will be economically successful. A vibrant cultural activity that would result from networking between cultural and research institutions and the university would improve the people flow and in turn generate synergistic effects and increase income from tourism, believes BP.

Until now, and probably also in the future, these activities will depend on European funds and national projects. There have been national tenders for the



popularization of science, but there are a lot less now, says MC, and proposes that this could be partly compensated through the university asking its researchers to volunteer in SCIP events. The development policy should make efforts to achieve favourable impacts with relatively small resources.

EK hopes that the state will keep to its strategic goals adopted for this field and will continue to facilitate the activity of institutions such as the National Science Foundation. He misses more trust in non-governmental organisations by the administration. He finds that major sponsors remain faithful mainly to culture and sports and lack awareness of the fact that investing in the promotion of science yields similar effects to investments in development. According to him, sponsorship develops, but:

*“The psychological impact of the crisis is not reflected in smaller membership, but in smaller total income. We are doing our best to change the psychology of donorship. You still get donations on account of a sense of charity or because they were asked and it would be impolite to say no, and not because of genuine confidence in the effects and urgency of our efforts. It's about raising awareness that they are in fact making a change. Another problem is the unsettled relationship between donorship and sponsorship. As donators they are supposed to be anonymous, but this is not necessarily so. The media contribute to the problem because they refuse to publish the names of donors.”*

Considering the current situation in the country all interviewees hope the new science centre project in the city will kick off. The successfully completed cultural centre of European space technologies in another city inspires some optimism. In terms of larger investments EK points to a lack of a national development policy.

*“Polycentrism runs contrary to a larger concentration of funds in a single project. Individual protagonists bring forward different ideas they want to see come to life, so we never see the progress we all want. This also runs contrary to the European Commission's policy in this field. The problem is the lack of a European dimension, a European added value which should consist in a practical dissemination of results, so that a certain experiment developed within a project can be used by all science centres. Smaller centres are therefore viable as they would apply the knowledge already developed within other European projects.”*

The fourth set of questions focuses on the impact of SCIPs on education.

As regards the impact of science on education the interviewees agreed that there has definitely been an impact, especially on the teachers. In the House of Experiments, for example, teachers learn how to conduct an experiment. Whenever there is some prepared material that comes with the activities teachers grab it like hot cakes. An online newspaper has about half a million visitors a year, mostly teachers. Online lectures also have a large

audience. It is agreed that there should be more materials available and these should be of better quality.

The interviewees think that institutions have become aware of the importance of communication and have opened their doors to the public. Open doors days, scientists' night and similar events have become popular and some institutions have already had a lot of success. In institutions where this has become a regular practice, the number of visitors remains constant.

BP finds it important for laboratories to open their doors, especially in order to allow insight into what actually goes on there. In order to stir interest in, and desire for, activities and study of natural sciences, people need hands-on experience. Every institution should have a special service organised for this purpose. In this respect, SD stresses the importance of professional training. The answer could be the new study course in museum paedagogy at the faculty of education in the city. MC is in favour of a more open curriculum that leaves room for SCIP activity.

*"The vision is, for example, a program for physics in secondary schools that would be open enough to allow for integration of all other actors, from museums to institutes and similar, that offer transfer of knowledge or transfer from modern research to students. Teachers should be given enough freedom to be able to take advantage of that. And, of course, teachers' training in extra-curricular subjects, as the subjects in the curriculum are often a hundred years old or more. This way we could show students that science today is alive and relevant, that there are products in everyday life that came to life a few years ago. This is where science communicators play a vital role."*

In terms of development, EK and SD think that because of its size, the country needs the help of the state even more, especially in view of the fact that demand is really high, especially from schools. The state could in fact do more, not only in terms of funding. SD is critical of public tenders, but remains optimistic:

*"It all depends on the people. All too often someone with an idea gets rejected. Tenders are problematic. The right idea should be recognized and supported. More often, however, good ideas are overlooked or neglected. More important than formal conditions for the tender is to detect good ideas and formalize them through tenders. But I'm an optimist and the city is going in the right direction towards a modern innovative society. If the crisis doesn't thwart all these efforts we have nothing to be afraid of."*

Optimism is partly justified also by the claims made by those who shape the development policy of the city and the region (MF and AC). They are aware of the importance of popularising science and developing scientific literacy and this has been integrated into development documents.

*“It's essential for the post-industrial society to foster curiosity and creativity. Both in a social and economic sense. Science communication can significantly contribute to that. We expect a lot from the young, not only because they are enthusiastic about research, but also because their curiosity remains unconcerned with boundaries. With such intellectual freshness they can attract more mentors and catalyse understanding and cooperation between different disciplines. The municipality of the city will continue to pursue activities for the promotion of science and development of a culture of science and technology. This commitment is part of the 20<sup>th</sup> goal of the strategy of development of learning and education in the municipality of the city for the period 2009–2019 which puts a special emphasis, among the programs for quality leisure activities, on those which promote science.”*

### **Module C1: semi-structured interviews with actors**

The answers to interviews with actors (module C1) were grouped into two research questions:

- What was the motive or interest for cooperation?
- What impact did this cooperation have on the actors (feedback)?

The following observers/stakeholders were interviewed: as institutional actors, KF, MSc; JB, PhD; and MK, PhD. And as representatives of scientists KS, PhD; and SD, PhD.

The main motive for cooperation with the science centre was greater visibility of the faculties. This cooperation was therefore, at least initially, used for the promotion of their study courses (electrical engineering, mechanical engineering and physics) and the recruitment of new students. Once this cooperation has strengthened and the activities have developed to the extent they have today, this has produced synergistic effects, says KF. This is not only about developing competition between participating faculties, the country is small and some courses are conducted at only one or two faculties; it is about being competitive against social sciences, at least in terms of student recruitment. According to MK, the predominant interest of the participants today is the promotion of science and technology in the widest sense, arousing interest among the young for these subjects, not only to provide a sufficient number of students for their own faculty. KF adds that such campaigns are in line with the pursuit of the faculty's vision and mission, which is to raise the general level of scientific and technological literacy.

KF attributes increased enrolment in study programs in natural sciences and technology also to these efforts. All interviewees agree that faculties' visibility has increased. The faculty of electrical engineering received a national award for the promotion of science. The faculty of mechanical engineering was invited to the panel discussion on the promotion of science organised by the National Academy of Sciences and Arts. Through the “Chain Experiment”

conducted in collaboration with the science centre, physics students are given the opportunity to enjoy international exchange programs.

A strong incentive for collaboration is the response of the public, which was described as “above average”. They are critical of the media who don't tend to publish anything on such events at their own initiative. JB mentions also the role of students. With this form of collaboration they would gain much more than within the regular study program alone. They acquire organisational and team work skills, they learn to improvise, develop their communication skills and similar. Students also become acquainted with different audiences, from children to pensioners, and all this contributes to building a proficient science teacher.

Networking and collaboration between different actors cooperating with the science centre has not been established as of yet, but the interviewees find the idea interesting. This is partly due to a lack of time. All activities are conducted on a voluntary basis, although with a strong moral and organisational support of the faculties. The museum contributes a small fee for the students who conduct demonstration experiments. All other costs, including the preparation and conduct of experiments, preparation of exhibit pieces and accompanying written materials are borne by the faculties, so there are no economic benefits, only costs. One of the forms of financing was the funds allocated to the tender for the promotion of science to which the faculties could apply. Regrettably, there has been no such tender yet this year. Interestingly, however, two institutions for promotion activities liaised with professional PR agencies.

The interviewees also agree on the feedback from their faculties. Those who are actively involved with the museum activities are those most supportive of such cooperation, whereas other actors tend to be either reluctant or they see it as a lot of work for little or negligible effect. JB estimates that the department's cooperation with the museum has been positively appraised by the faculty. Although the faculty does not put forward any concepts or project designs, it supports them when they are proposed by the departments. There is no competition between departments, but there is no cooperation either. Departments are also not interested in liaising. MK describes how they organised the process and what the response was like:

*“At our faculty the process is led by laboratory heads, they were invited and some of them volunteered. If we develop something we also have something to show for it, there is no need to prepare experiments, apparatus and similar again. Technology is not like other sciences, it is not about some basic laws, it's the superstructure that incorporates different laws into a technical system. At the same time we mustn't stray into some details, as they are neither interesting nor understandable. We try to show the results of our research at some basic level; we show, for example, how you*

*measure noise, where this is used and what the device looks like. It's not about a scientific experiment, but it uses the same equipment. The students also participate individually, it's not part of the study process, it's something extra. They might use something in lab work and vice versa. On the whole, these are positive activities and we will continue to conduct them now that we have everything well in place."*

The participating actors did not take part in any additional training on account of their cooperation with the science centre. The researchers are mainly higher education teachers and therefore have the corresponding paedagogical and andragogical qualifications, so they feel they've had sufficient training. Cooperation is conducted on a voluntary basis and only those researchers who like this kind of work apply for it.

As for getting feedback about their research activity they find it to be minimal. KF finds the reasons for such situation in the current research policy:

*"After the lectures there is usually a debate and if there are experts present there may occur an idea on how to proceed with the research. However, the way research is conducted today is that you apply for projects, select the fields that have priority in financing, and priority is given to the studies that have already been planned, so it's really difficult to turn new or original ideas into a successful research program."*

## Conclusion

Visitors love the museum; they are fascinated by the exhibited pieces and partly by the museum building and the environment. Visits are mainly planned as a social event, museums function as a place of spontaneous learning with people being keen on broadening their knowledge and experience while in turn building their status. Parents therefore explain things to children, men, who often have more technical knowledge, share their experience with their spouses<sup>1</sup>, friends with friends etc. This was also one of the main reasons why they prefer learning in a museum to learning at school. The fact that the visit to the technical museum was seen as more interesting than visiting an art gallery or a cultural event can be attributed to the structure of visitors. Most of them are interested in technology; they have a background in technology and technical professions. There are differences in the impact and perception of the museum among first time and repeat visitors. The latter tend to be more critical of the economic benefits of the museum for the region, the information and knowledge offered by the museum as well as of the impacts on the visitors' knowledge. They all see the science centre as a significant factor in the cultural life and tourism in the region and the country. The visitors evaluate the role of science and technology for today's society as very important, mainly in terms of utility; however, there is poor understanding of the nature of modern science and it can be concluded that most visitors take the positivist attitude and understanding of science.

Understanding and interpretations of the added value to be contributed by the “culture of science and technology” vary considerably. Interviewees stress synergistic effects where several institutions and events collaborate and complement each other, which have an impact on the development of an innovative society. It is important to develop public understanding of science, at least to some degree of scientific literacy and of understanding that science is a strong development factor. Added value implies also collaboration between natural and social sciences, between art and science, urban culture and the culture of the province. This would contribute to a new society with a different understanding of ecology, humanities and natural sciences. The importance of two-way communication is emphasised because it is seen as vital for the “culture of science and technology”. A successful communication of researchers with the environment would increase the level of understanding of scientific activity and the scientific community would react more quickly to the problems and issues of contemporary society.

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<sup>1</sup> The Coordination Team would like to point out that, although this sentence might sound sexist, it should not be read as such. The investigator's intention was to comment an observed behaviour that, unfortunately, still occurs in science centres nowadays.

Interviewees have more consistent views regarding the role of the local community in development and place regions and local communities at the centre of activities. At the moment there is still a positive atmosphere in the city regarding this kind of development, supported also by the local authorities. Initiatives come mainly from civil society organisations, especially from groups of younger researchers, and it is on the political sphere to open the doors and, where and when it is possible, to provide a suitable infrastructure. They are critical of the existing SCIP institutions in the city. These should, to a larger extent, become centres of activities and meetings and act as serious mediators between the public and science.

When asked whether the effects of SCIPs reflect the public voice in science and technology related issues, they all gave a positive answer but left a lot of room for improvement, especially in terms of the media as communicators of communicators.

According to them, the most relevant development policy would be to invest in education, especially the education of teachers, as well as in training of researchers for communication with the public. The development strategy should consider the ideas of collaboration between the economy (businesses), the public (city) and science (university, institutions) and multidisciplinary cooperation between technology and natural and social sciences. Intergenerational collaboration in science centres is seen as good practice. Optimism is probably justified by the city and region's development strategy documents which clearly define the popularisation of science and the development of scientific literacy.

Opinions on the extent to which SCIPs impact on public participation in different debates and activities are divided. It is difficult to assess such impact due to the role of the media, which are often the loudest communicators. It has been proposed that despite good communication, the public needs time to learn, a training period.

Interviewees from the stakeholders group are very critical of the media. They think that the journalists who cover science in the country lack proper education and should have some additional training. Ghettoization of science news is seen as another drawback, as science is never featured on cover pages. It is agreed that researchers lack the knowledge of how to report their work. They therefore welcome activities that can compensate for that. The interviewees agree that activities of SCIPs change the cultural identity of the city. Such developments have also been detected in the city, but a lot remains to be done. It is necessary to make investments in people and infrastructure, as well as to reformulate activity contents from scientific literacy to the development of identification with a technologically innovative society.

Economic impacts of SCIPs occur in companies that participate in the promotion of science –if it is in line with the economic mission of the company. In addition to direct economic impacts that could be generated through the establishment of young experts' companies and concentrations of innovative and integrative approaches that could attract foreign investors, long-term effects, such as increased interest in nature science study programs, should also be considered.

Up until now, and probably also in the future, these activities will be funded by European funds and partly by national projects (national tenders for popularisation of science). With its small market, the country really needs state support. However, as fewer resources are expected, the development policy should work towards achieving beneficial results through relatively modest resources (volunteerism, donations and sponsorships).

Considering the current situation in the country, all interviewees hope the new science centre project in the city will kick off. The successfully completed cultural centre inspires some optimism. As regards the impact of SCIPs on education the interviewees agree that there has definitely been an impact, especially on the teachers.

The interviewees think that research institutions have become aware of the importance of communication and have opened their doors to the public; events, such as open doors days, scientists' night and similar are gaining popularity. Some institutions have already achieved good results through that. It is important, however, to train experts for this purpose. The answer could be the new study course in museum paedagogy at the faculty of education in the city.

The general assessment of the actors –researchers from faculties and institutes– of the cooperation with the science centre is positive and they intend to continue to participate with similar activities.

The original motive of all the participants was to motivate students for technical and natural science studies and to increase the visibility of faculties because there was little interest for these studies in the country at the time. Later, after cooperation took off, there were also synergistic effects and today the focus is not so much on the competition between the participants, but rather on the competition with social sciences. The initial interest of the faculties developed into the common interest of the participants to promote science and technology in the widest sense. The initiatives for these activities come from institutions' managements and their invitation is most often answered by those researchers who enjoy working with the young and the lay public. This cooperation is therefore conducted on a voluntary basis and receives no financial support. The participating actors received no special training for these activities. The researchers are mainly higher education teachers and therefore



have corresponding paedagogical and andragogical qualifications, so they feel they have had sufficient training. In institutions, cooperation with the museum is most supported by those who are actively involved in this cooperation, whereas others tend to be either reluctant or see this as a lot of work for little or negligible effect. As a rule, the response to such campaigns within faculties has been positive. The feedback on the impact of these activities on the researchers was that this impact is minimal, partly also because of research policy.

## Recommendations

Museum activities (workshops, lectures, exhibitions) should also focus on the understanding of scientific activity and the role of science in a modern society, on the understanding of the relationship between science and technology. The history of science and technology has a wealth of fascinating stories that could bring these contents closer to the general public. This would substantiate also the purpose of basic research that is all too often viewed by the public as intended only for researchers themselves. At the same time this would be a step from scientific literacy toward developing a sense of identity with a scientifically and technologically innovative society.

Museum activities should be extended to other areas. “Days of” physics, electrical engineering and mechanical engineering should be accompanied by days of other natural sciences and mathematics.

Development of an innovative, technological society must be based on quality teacher training. Curricula should be open enough to enable teachers to integrate the activities offered by the SCIPs. More learning should take place outside school. Materials (worksheets, applications) created in the process are very useful for teachers. On the other hand it is also important to train the other side, i.e. the experts and researchers, to communicate with the public. New university study programs should also take into consideration these requirements.

It is important to bring museums and similar institutions closer to the widest public. Collaboration of different institutions working in culture, science and arts generates synergistic effects. Museums should become meeting points for creative and innovative potentials and a place of intergenerational learning- and experience-sharing. Senior visitors represent an important segment of the public.

Research institutions should further open themselves to the public. The public should learn more about what goes on in development departments of factories, laboratories, hospitals, and anywhere else where scientists generate new insights. Research institutions should employ adequately trained experts to this end.

The media should take care of proper education of journalists working in science. Science should be featured more often and be reported by better informed writers.

Although science and technology will continue to depend strongly on budgetary resources and European projects, it is important to develop different forms of sponsorships and donorship.

With its geographical position, size, economic power, structure and the intellectual potential of its residents, the city already satisfies a number of criteria to implement the vision of a modern, vibrant, innovative, culturally and technologically developed centre, not only in the country, but also in its wider region of Europe. A centre that will do more than just motivate the city's residents, but also attract foreign visitors and experts and prompt them to stay. Some of this has already been mentioned in the city and region's development documents, including the construction of a new science centre. With its technological accomplishments and architectural design, this centre could become a decisive turning point in accomplishing our vision.

### **Recommendations about the use of selected instruments**

#### Standardised survey of visitors Module A2

There are several questions that lead to expected –positive answers. We propose additional questions to check the reliability of answers.

#### Semi-structured interviews with visitors Module A1

Questions from Module A2 repeat, the participants' answers are modest and do not contribute much more data than the survey. Perhaps the interviewee sample should be larger or these interviews could be omitted.

#### Semi-structured interviews with stakeholders Module B1

Questions are general and unrelated to the study baseline, in our case the science museum. Some questions are repeated, e.g. impact on the public voice.

#### Semi-structured interviews with actors Module C1

Questions on the impact of the activities in the museum on the actors' own research is promising, but does not work in practice. In view of the research policy and programmes adopted by research institutions for the long term, there are few possibilities for such impacts.

## References

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