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Science Communication and New Technologies
The *Aiguarium* Project[1]

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Abstract: The Aiguarium project is a science communication service based on an alternative model of communication, centered on public participation. The service is built around a new technology: the world wide web. The implications of the new model and the new technology are studied both at user behaviour and work methodology.

Keywords: science communication, internet, electronic publishing, adaptive websites, information services.

Introduction

There is a wide agreement about the existence of a serious deficiency in science communication. One possible reason for it may be the lack of a dialogue between the those who generate scientific knowledge and the people supposed to receive information about it. In that sense, it has been suggested that public interaction may be of interest to the process of scientific knowledge communication. The argument in favour of such participation is related to the eventual gain in reflection and decision abilities by the audience, about those socially important subjects in which Science is involved.

Although this dialogue may be necessary, it is usually hard for the general public to initiate it, since, presently, experts are the ones who decide what is adequate enough to be communicated, as well as when and how it must be communicated. The interests of the public seem not to have a direct influence on the design of Science communication strategies. This is in contrast with the widely accepted principle that audience interests should be taken into account when shaping any communication product.

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Such state of things, from our point of view, has its roots in the acceptance and use of traditional communication models, based on current communication media, which assume and impose a *unidirectional* flux of information. Recently, it has become evident that the effectiveness of this traditional model of communication has reached a maximum, at least in Science communication.

Therefore, it is very important to experiment with new and more effective popularisation strategies, in order to overcome the shortcomings of the traditional unidirectional model. Given that surveys about knowledge communication also suggest the need to test the impact of an individualised treatment of information, it seems also interesting to investigate how to create adaptable science communication services.

Such a service should allow people to make explicit their scientific knowledge demands. From our point of view, this involves the use of a *bi-directional* flux of information: one coming from the audience and the other from the experts. *Communication flow is not an arrow but a loop.* New digital media, with their inherent bidirectionality, seem to offer technological support for a two-way communication model for science popularisation.

In this paper we describe how these assumptions were put to practice and were tested by designing and developing a real service based on them: the *Aiguarium* website.

The aims of the *Aiguarium* Project

Aiguarium is a project carried out by the *Observatori de la Comunicació Científica* at the *Universitat Pompeu Fabra* in Barcelona, Spain. Our main aim was to create and evaluate a science popularisation service in which the traditional communication model was modified in the sense of bringing the general public into the communication loop. The *Aiguarium* Project is a first step of a communication strategy; the gained experience may help to eventually sketch a methodology for creating and maintaining adaptive *science popularisation systems*.

The particular goals of the *Aiguarium* Project were, namely, the creation of an electronic publication centered around a common subject of interest to the audience everyday life; the creation of participation channels; the use of audience information for building a common information repository and the analysis of audience response in order to refine the system. The first goal was motivated by the importance of closeness of the subject to the users: we wanted to attract people to our service and to science. The second and third goals were related to the main characteristics of the new communication model: bidirectionality and participation. The last one was a necessary step for devising adaptation actions.

In order to reach these goals a system was devised accordingly, and a routine of work was established.

System design and working method

A specialised electronic publication on water was designed: the *Aiguarium website*. It was organised around biweekly monographic editions dealing with different subjects or concepts related to water (subjects of initial editions were selected among those identified in a previous phase of the project, and later from user demands). The language and navigation structure of the publication were designed to encourage participation. There existed different mechanisms of interaction (electronic mail, forum, electronic survey forms). The design was also crafted so as to track user's behaviour, gather data about it and analysing it later.

Each edition had an active life of fifteen days. After replacement with new contents the edition was stored and its contents made accessible through a different navigation path: an index. Indexes were organised around the core concept of each edition. In this way, analysis of the influence of access paths to information could be performed.

The editorial team was organised around four different profiles : expert, mediator, electronic designer and analyst. *Experts* had an intermittent participation in the edition process as they were contacted and asked for information by mediators in response to audience demands. *Mediators*, developed electronic contents while filtering public demands and adapting experts responses. *Electronic designers* modified graphic design of the website as well as navigation tools in response to the needs expressed by users or revealed by analysts. Tracks left by users in the website logs as well as the responses to the survey forms, were worked on by *analysts* These data were used to make decisions about edition contents and overall system architectural design.

The initial work routine was very similar to any other traditional publication. Editorial team meetings set the subject for editions (modulated by received user demands) and each member received assignments in order to create content. Other results of these meetings involved changes in website design.

In order to reach this organisation and routine several tasks were detected as necessary.

The tasks of an adaptive science communication service

Several tasks can be isolated as basic for creating the type of service that the *Aiguarium Project* exemplifies.

- **Task 1: Choosing the subject**

  The need of a subject related to everyday activities lead us to choose water as the core subject of the service. Water can be approached from significantly different points of view, namely, Health, Environment (two issues that people are highly concerned about), Economics, and so on. Being a concept with so many cultural, psychological and scientific implications, water allows any information related to it from a global perspective, in which no predominance is given to any particular discipline. Scientific, technological, and cultural concepts and facts can be presented in an interrelated fashion. With the aim to detect public subject preferences around water, a series of chats were organised on a weekly basis

during a six-month period. Upon analysis of the chats the main areas of interest were inferred, as well as the possible approaches to those areas from a receptor's perspective : Culture, Health and Environment.

- **Task 2: Detecting interests.**

Although the first task had a limited duration in time, it could also have been incorporated to the continuos operation of the service in order to detect new interests. What was really going on along the whole project was the reception of mails, the observation of forum interventions and consultations to the ongoing survey. These information suggested new subjects and areas of interests as well as suggestions for different treatment of previous subjects.

- **Task 3: Analysing user behaviour**

Several control groups were created in order to test for variations in users behaviour and assessment of the service. Initially the groups were: university science students, university journalism students and secondary school students. Another group was formed by the general public. Each one of these group could be identified when accessing because each one was given a different entrance point to the website.

The measured aspects of their behaviour were :

1 *Overall assessment of the service*: this was done through and on-line survey form. Evaluated aspects were: satisfaction level with respect to participation (as seen from the point of view of the user); overall design (graphic and navigation) and how users get to know about *Aiguarium*.
2 *Type of participation*: User contributions were classified as: question, information resource request, suggestions, comments on the service and related subject of the intervention. This analysis was made by tagging mail messages received during the duration of the experiment.
3 *Navigation*: Navigation paths of real users were reconstructed by analysis of the log files of the system. Two new software programs were designed and implemented in order to obtain this information: one that gave general statistical information (number of accesses to editions, pages, etc.) and the other that generated individual user navigation trajectories (successive pages accessed by a user) and allowed to classify them.

Assessment

According to the collected data, there appeared some interesting observations related to the different measured aspects.

The survey results seem to indicated that people had a very high degree of satisfaction due to the ability to participate trough questions, information supply and suggestions. What users ranked higher was the fact that they saw their own suggestion and information incorporated to subsequent editions.

As to the mechanisms offered to them for participation, most criticisms were centered around the initial graphic design and navigation facilities. This led to the introduction of a new homepage design and of a refinement of the index access.

It is worth mentioning here that there was an imbalance in the use of different means for participation. Overwhelmingly users preferred e-mail rather than forum when participating. There are similar results from the analysis of website users preferences, which give us a possible explanation for that: the “anonymity” of mail, which is seen only by mediators but not by the rest of users. This has to be further tested.

As to the type of interventions corresponding to user messages there are several facts to be remarked. Interestingly enough, most users *ask* : 58% of the interventions correspond to questions, and the rest is devoted to supplying information. It is also interesting to see that some of the requests do not fall on pre-existing indexes of concepts but are requests for further information resources. Groups show different behaviours and it is interesting to see that general public poses a higher proportion of questions. Audiences seem to be more active than it is usually thought. This may give evidence in favour of the bi-directional model.

User behaviour with respect to access to editions shows similar behaviour to other traditional media. Upon publication of an edition, a high number of hits go to the edition homepage and, after fifteen days, it decays abruptly, when the edition is stored. Later, interest steadily goes up.

Behaviour related to access to information suggests also interesting questions. As it has been said, website contents could be accessed through the current edition homepage or through indexed keywords. Measuring accesses through these two paths had the goal to see how much people was attracted to subjects in response to the edition main content, in contrast to their active role of searchers for their own information interests. There are significant differences between patterns of use, which give different impact to different subjects of interest.

Discussion

The results of the experiment show the feasibility of a science communication service based on a bi-directional model, which favours a particular relationship between public and experts in which the latter do not have a dominant role.

It is also remarkable the importance of mediation in the system’s performance. This means that an information professional is required to act as mediator between public and experts. Mediation teams must be capable to interrelate different scientific fields, incorporating the information provided within a particular area to a wider social and cultural context.

It has also become evident that the medium chosen to develop this experience, hypermedia, makes quick adaptation to demands possible, in contrast to classical media, thus providing a useful instrument to be used in science popularisation.

Also, the results generated from surveys suggest that the transformation capability and adaptability to different interests exhibited by this service constitutes an important value to add to those previously discussed. The experiment has allowed us to detect the presence of differentiated communities of interests.

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