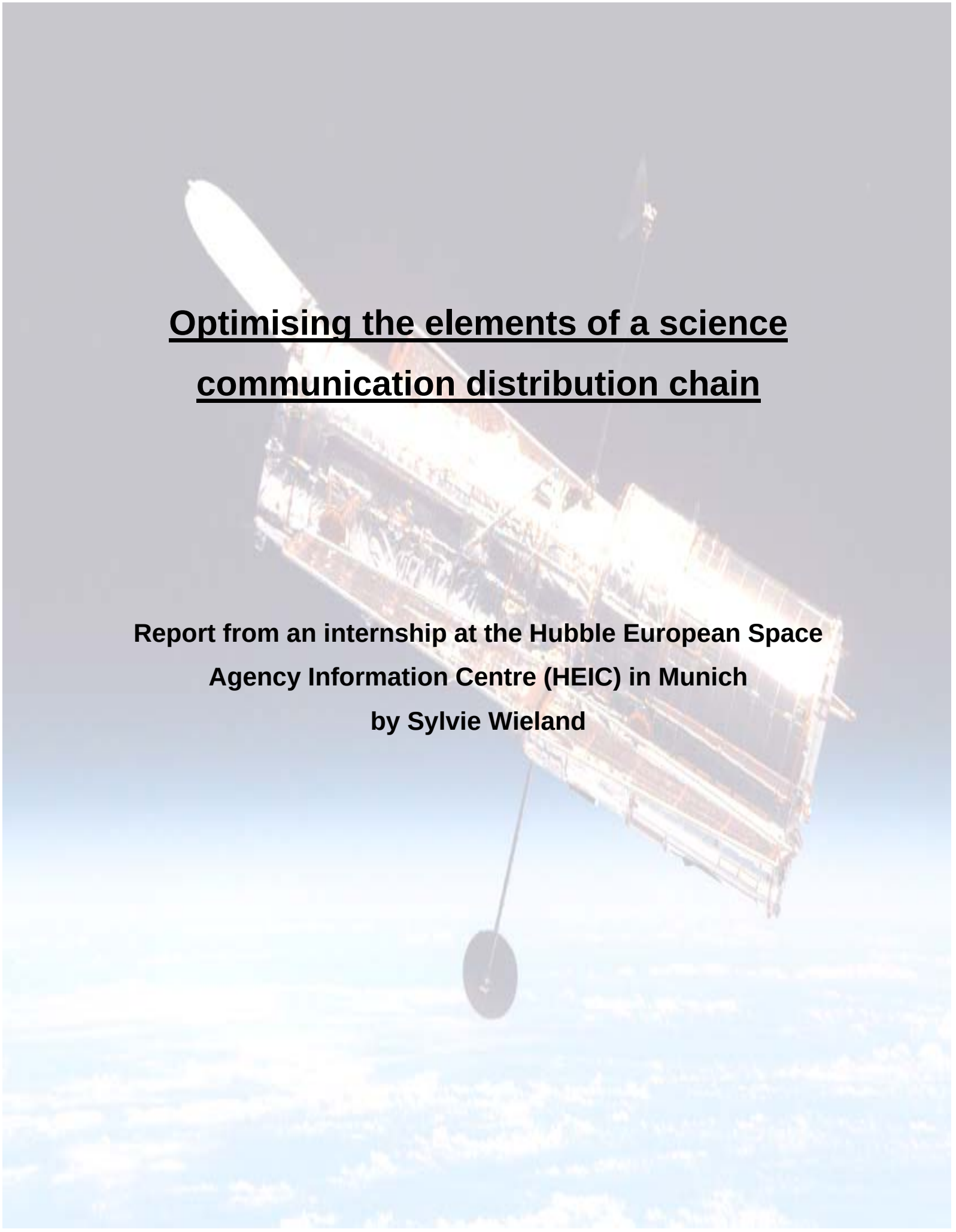

Optimising the elements of a science communication distribution chain

Report from an internship at the Hubble European Space Agency Information Centre (HEIC) in Munich

by Sylvie Wieland

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Part I. Introduction

1. Preface

This report describes work carried out during an internship at the Hubble European Space Agency Information Centre (HEIC) in Munich (see Section 3.1).

The Internship lasted from 23. June 2005 to 23. September 2005, during which time I was able to learn more about science communication and to deal with some challenging tasks in this area.
I chose this special branch of Public Relations to gain an insight into the work and communication between scientists and the European public. I learnt how such an organisation is structured and experienced the daily routine and the kind of unexpected challenges that arise.

2. The Task

My main task was to make recommendations that could improve elements of the distribution system at HEIC and to implement them.
This was part of a long running project at HEIC to investigate and research possibilities for a simpler, well-structured science communication distribution system. The work was divided into four phases, beginning with an analysis of the actual situation, followed by brainstorming for new recommendations, implementing the recommendations and finally evaluating their effectiveness.

Part II. Research

3. The Organisations and the Hubble Space Telescope

3.1. The Hubble European Space Agency Information Centre (HEIC) and ESO

The Hubble European Space Agency Information Centre (HEIC) was created late in 1999 as a science communication office at the Space Telescope - European Coordinating Facility (ST-ECF) in Munich. Its job is to fulfil the Hubble Space Telescope outreach and education tasks for the European Space Agency, ESA, as outlined in the agreement between NASA and ESA (the so-called Memorandum of Understanding).[1] In principle, HEIC's function is to communicate science, and specifically, astronomy and the results from the Hubble Space Telescope, within Europe. Over the years it has become one of the most productive and innovative science communication groups worldwide.

HEIC is part of the ST-ECF which is a collaboration of ESA and ESO, the European Southern Observatory (ESO). The latter was created to

> *"establish and operate an astronomical observatory in the southern hemisphere, equipped with powerful instruments, with the aim of furthering and organizing collaboration in astronomy"*.[2]

ESO is supported by twelve European countries (Greece, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Portugal, Sweden, Switzerland and United Kingdom) and the U.S.A. It operates at three sites in the Atacama Desert in Chile, having built several telescopes, for example the Very Large Telescope (VLT) (Figure 1**Error! Reference source not found.**).

[1] http://www.spacetelescope.org/about_us/heic/heic_latest.pdf, 23.08.2005.
[2] http://www.eso.org/gen-fac/eso-info.html, 14.08.2005.

Figure 1: Very Large Telescope in the Atacama Desert in Chile (Source: http://www.eso.org/projects/vlti/images/vlti-array-smallsize.jpg, 02.08.2005.)

3.2. The European Space Agency (ESA)

The European Space Agency (ESA) is the space organisation that is responsible for the planning and execution of the European space programme. ESA's target is to carry out projects that find out more about the Earth and the immediate region of surrounding space, the Solar System and indeed the whole Universe, and to develop new satellite based technologies supporting European industries. ESA has 17 member countries, namely, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Canada, Hungary and the Czech Republic also participate in some projects under cooperation agreements. ESA is an entirely independent organisation, although it maintains close links with the EU through an ESA/EC Framework Agreement. The two organisations share a joint European strategy for space and are developing a European space policy together.[3]

[3] http://www.esa.int/esaCP/GGG4SXG3AEC_index_0.html, 02.09.2005.

The three organisations, ESO, ESA and HEIC co-operate closely with each other, sharing information and instruments. ESO and ESA exchange the data recorded by their telescopes to compare the new information and continue working with it.

ESA also provided 15% of the finance for the NASA/ESA Hubble Space Telescope and as a result can work with the telescope and receives all the recorded data. HEIC is the department of ESA that takes care of public outreach for Hubble in Europe. As ESA and ESO co-operate with each other, the HEIC is situated at the headquarters of ESO in Munich to improve the interactive workflow between the two organisations.

3.3. The Hubble Space Telescope

The Hubble Space Telescope (see **Error! Reference source not found.**Figure 2) was created as a collaboration between ESA and NASA. It is a space-based observatory that has been in orbit about 600 km above the Earth's surface since 1990. From there it can take pictures that are five times sharper and more precise than those from observatories on the Earth. This is the reason why the Hubble Space Telescope has made several of the most dramatic discoveries in astronomy, including measuring the composition of the atmospheres of other planets, discovering new planetary systems, monitoring the life cycle of stars, providing evidence that Black Holes exist, substantiating evidence that light does not always travel in straight lines, revealing extremely faint objects by making observations over long periods of time and establishing that the Universe expands at a rate of 70km/mpc, etc.[4]

Figure 2: Impression of the Hubble Space Telescope (Source: http://www.spacetelescope.org/about/index.html, 12.08.2005.)

[4] http://www.spacetelescope.org/science/index.html, 02.09.2005.

4. Science Communication in general

Why should science be communicated? Contact within the scientific community is maintained and cultivated with the purpose of collaborating and interacting with fellow scientists. Public communication is the best way to account for the activities of an organisation and incidentally enhances the image of a research institution as well. Contact within the areas of politics and economics is sought mostly for financial and image reasons.

Communicating science is one of the most challenging sectors for a Public Relations officer. For most people true science seems to be what they read in the press. This is their only contact with what is going on in this rapidly changing field.[5] So a science communicator has the responsible task of filtering the information and making sure that the public gets to know what is important. The main goal is to retain the public support of science and the funding that goes with it.[6] A German scientist, Rolf Emmermann (President of the Alfred-Wegener-Foundation) formulated it as follows:

> *"A scientist has to present everything that is current in his field in terms that a layperson can understand as well. We have the task to say clearly what we know, what we want to do and what the consequences are." (Source: Spiegel online, http://www.spiegel.de/wissenschaft/mensch/0,1518,215479,00.html, 25.09.2002)*

Emmermann refers exactly to a frequent public demand: The work of scientists has to be available and understandable for all. Even if a communication office has already filtered the information it is often still not appropriate for the general public, but only for a few experts.

The German ex-President, Johannes Rau, also emphasised the importance of making science available and understandable for everybody in a speech of 2002 given in Paderborn, Germany:

> *"From time to time,"* he said, "*there are reports of scientific breakthroughs for the benefit of health, a longer life, the final cure of illnesses, which we simply have to take on trust. I have no doubt that there is such significant scientific and technological progress. In many cases they are a real blessing. But I am worried by,"* and here is the crux of his message for scientists, *"the fact, that, except for the experts who are directly involved, there is almost nobody who is*

[5] Nelkin, Dorothy: Selling Science. How the press covers science and technology. New York 1995, P. 2.
[6] Nelkin, p.7.

able to assess what is really going on and what the consequences are for us all…So if a knowledge-based society becomes a society of ignorance by this means, then this will in turn have consequences for our idea of society." (Source: Müller-Jung, Joachim: Forschungskommunikation auf dem Prüfstand. In: Mager, B.; Hamacher, H. (Hrsg.): Marketing und Kommunikation von Forschung. Köln 2003, p. 43-44, translation: Sylvie Wieland.)

In my opinion Rau is stating that even well-briefed politicians are not really able to assess what scientists are doing with the result that the public can be left in - possibly unintentional - ignorance.

Operations that are analogous to Education and Outreach offices are found elsewhere, but the kind of communication practiced by Research Information Offices in Europe is currently very different from the work of a conventional marketing department, with the proviso, that most of research institutions expect that marketing will play a bigger role in near future, partly as a result of the increased interest in science in general and intensified competition between the institutions.[7]

As science communicator one does not deal with customers in the sense of vendees but rather as interested persons - what is being "advertised" and "sold" here is science. The targets are to inform, to impart knowledge, to develop a foundation of trust and to increase the level of awareness of the parent institute. This kind of science communication only works if there is co-operation between journalists, their editors, science communicators and the scientists themselves. Each group relies on the others either as sources of information or as a means of publishing this information to a wider audience. The primary target group, the public, is mostly addressed through a neutral third party, the mediators. The institutions themselves prefer to publish in professional journals and books or to appear at external events. These measures are often supplemented by the release of annual reports, brochures, Press and News Releases.[8] In addition the internet is used to spread information as fast and as widely as possible to the biggest audience possible. Scientists in particular have discovered the internet as a forum for discussions and direct contact with the public.

It is important for a science communicator to be able view things from a different perspective. In reality though, PR in research institutions is often restricted, for example, the release of

[7] Mager, B.; Hamacher, H. (Hrsg.): Marketing und Kommunikation von Forschung. Köln 2003, p. 11.
[8] Mager; Hamacher, p. 12.

information brochures etc.[9]. However society nowadays demands a new quality in the communication between scientists and the public:

> A change from monologue to dialogue, communication is no longer a one-way process where specialised knowledge concerning results and progress is announced by research institutions.
>
> This dialogue should be topic- and problem-oriented and, most importantly, interdisciplinary.
>
> Use of all possible ways of communication, the whole range of accessible media.
>
> This necessitates competence in intermediation amongst the scientists.[10]

Public opinion

In a recent survey by the European Commission, the European public was asked about its opinion concerning the PR work done by scientists or science communication offices. The table below (Figure 3**Error! Reference source not found.**) shows the degree of agreement or disagreement with the statement: "Scientists put too little effort into informing the public about their work". The EU average agreement with this statement lies at a fairly high 59 %, and the disagreement is only at 16 %. The Polish public feels the least informed by scientists with 69 % positive answers while in Belgium and the Netherlands there is the highest disagreement with the statement, at 25 % and 24 % respectively, so here at least the scientists seem to be informing the public regularly and more extensively.

European Commissions concerned with scientific projects and institutions can use these results to inform their future decisions as well as to guide decisions by the institutions themselves.

[9] Lerchenmüller, H.; Meiren, T.: Neue Wege im Forschungsmarketing. In: Mager, B.; Hamacher, H. (Hrsg.): Marketing und Kommunikation von Forschung. Köln 2003, p. 22.

[10] Radlanski, Heide: Push: Bewegung im Dialog zwischen Wissenschaft und Gesellschaft. In: Mager, B.; Hamacher, H. (Hrsg.): Marketing und Kommunikation von Forschung. Köln 2003, p. 60.

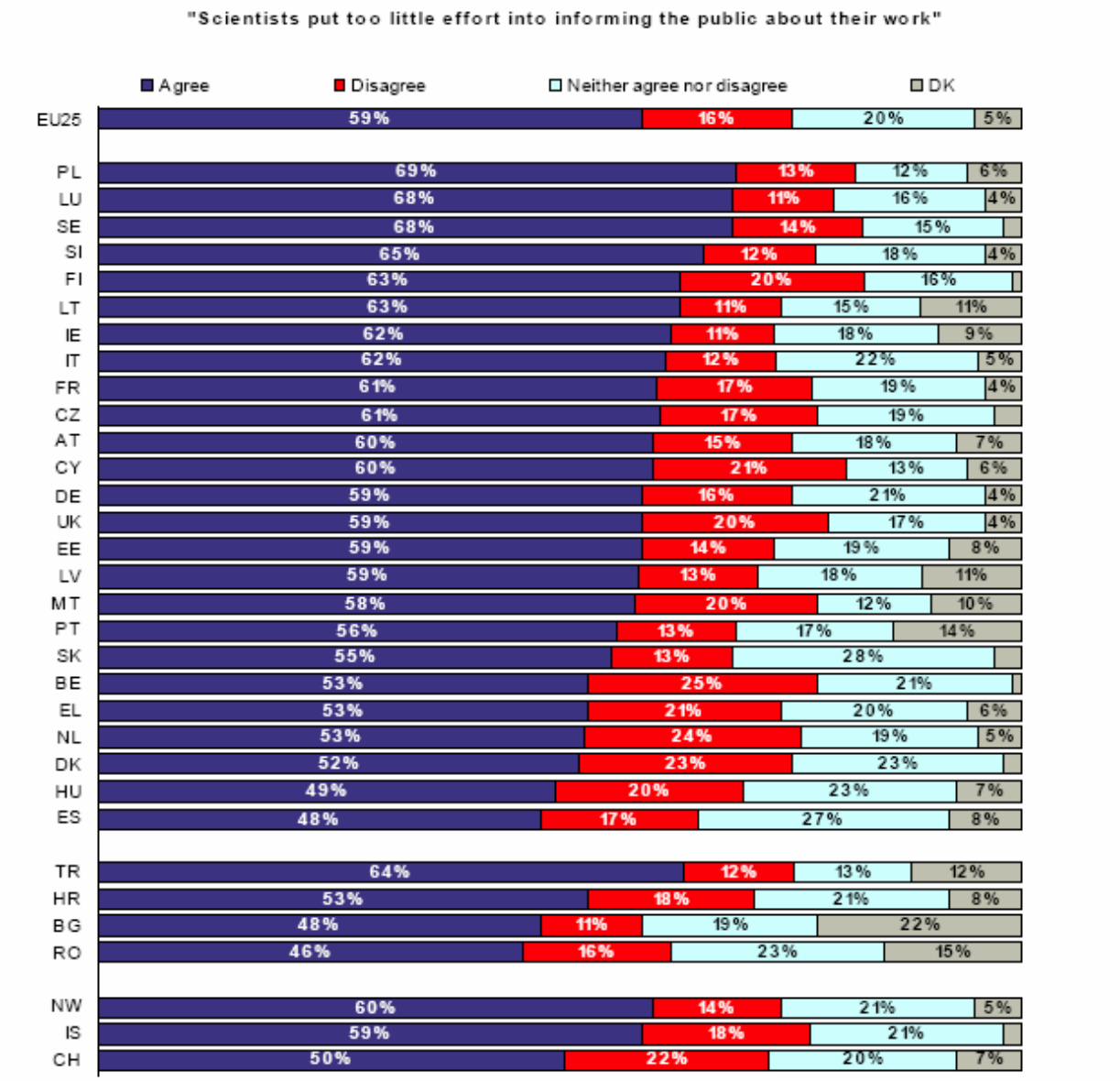

Figure 3: Percentage of agreement or disagreement to the statement: "Scientists put to little effort into informing the public about their work" in each country. (Source: European Commission: Special Eurobarometer "Europeans, Science and Technology", June 2005).

5. Science Communication at HEIC

Science communication as implemented by the HEIC involves the public communication of astronomy. HEIC is a unique organisation and so does not have to compete with many other organisations, but there is the drawback that there are no comparable examples of science communication that could have been used as a model in the HEIC's early stages. The target of HEIC is to "advertise" astronomy, in the sense of making it more popular, and to make the

existence of ESA, Hubble and itself better known, with the additional difficulty of reaching all European nations in their individual languages.

Tasks executed at HEIC by the head of the department include:

- Management (includes collaborations with ESA, ESO etc.)
- News and image production
- Production of printed products
- Production of electronic products
- Education (incl. material, student supervision)
- Distribution (incl. point-to-point, sale, web)
- Support of media/public
- Infrastructure development and maintenance
- Projects (FITS Liberator, KIOSK, Virtual Repository)
- Training
- Misc. (includes collaborations with ESA, ESO etc.)

Most time is spent on the production of news and images for the news media and only a little time can be spent on education and training.

Tasks executed by the Graphics Designer have a different emphasis and include:

- Video animations
- Image processing
- Illustrations
- Layouts
- Misc.

Here, most time is spent on creating video animations and the least on illustrations.

5.1. Target Groups

A science communication office like HEIC has several target groups that can be divided into two main categories: target groups that are reached directly and mediators who pass on the information to other target groups.

Target groups who are reached directly can include the **general public** (the end-customers) via webpages[11] but they are more likely to be reached indirectly via mediators (see below). In the case of direct communication a group has to "pull" its information out of the communication office

[11] Christensen, Lars L.: A hands-on guide to science communication. Munich 2003, p. 22.

via the web. A so-called “push”-communication to the general public (where the organisation “pushes” the information towards the target group) can only be implemented through mediators due to the high population (455 Mio) in Europe.

One other very important target group who are directly reached are the **decision-makers**. This group has to be treated attentively and targeted with products that are of higher quality, for example brochures, annual reports, printed Press Releases etc. In the case of HEIC this group includes politicians as well as industrial decision makers.[12] As decision-makers are rarely scientists themselves, they are dependent on the information they receive either from the communication office or the mediators. The latter can often influence the decision-makers with direct consequences for funding levels.

Another target group is **other scientists** - they may be familiar with the subject and while the communication may be perfunctory or over-simplified from their point of view, they are still interested in the work of other scientists and want to be informed, for example through Press Releases or the web.[13]

The graph below (Figure 4**Error! Reference source not found.**) shows how HEIC estimates the different weights of its target groups and the importance it apportions to each product in relation to the target group, here indicated with grades from 1 (not important) to 5 (very important). The graph refers to layout on the HEIC homepage.

[12] Christensen, p. 22.
[13] Christensen, p. 22.

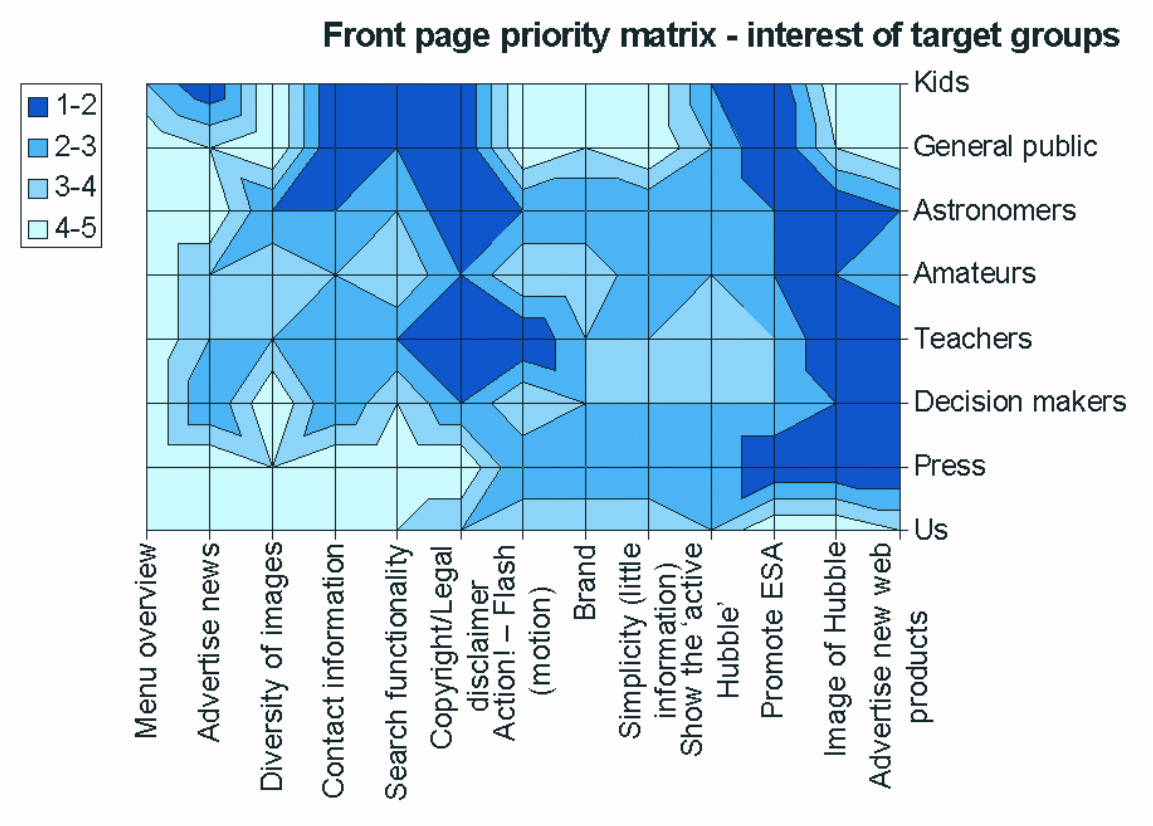

Figure 4: Matrix showing the importance of the different target groups as basis for creating the front page of the web appearance. (Source: ST-ECF Newsletter 36, http://www.spacetelescope.org/about/further_information/newsletters/html/newsletter_36.html, 13.10.2005)

The mediators are most important target group in terms of the level of awareness of the organisation. Mediators are persons or media who multiply and spread the information released by an organisation. Media can be for instance, television, news agencies, radio, all kinds of newspapers, magazines, the internet, books, etc. Mediating persons are, among others, educators, scientists or communicators in scientific institutions. A communication office like HEIC is essentially dependent on these mediators to reach as many people as possible. The main mediators for HEIC are television, newspapers and individual journalists.

Products/Means of communication

As mentioned before it is not the task of a science communication office to sell something material, but to "sell" and "advertise" science and "feed" the public with information. Products offered by HEIC are, among others, Press Releases (printed and electronic), Video News Releases, brochures, CD-ROMs, webpages, educational material, exhibitions, press conferences, press packs, public talks, etc.

Press Releases have become a standard in this industry and are expected by the target groups. They are published on the web for everybody to read and sent out as printed releases to significant persons such as other mediators and decision makers.

To communicate science effectively it is essential to publish brochures even though they can be costly and labour intensive. Several editions tailored for each group can cater for the different interests of the target groups or a careful analysis of the separate interests can lead to a well-proportioned balance between promotion, facts and entertainment within the brochure[14].

Producing each new brochure is not a completely new venture, the style of the author and the designer should create a distinctive style common to each production. Most Communication Offices aim for instant recognition by the customer/target group. They try to ensure that recognition by using the same logo, a similar layout and design, the same format, etc. for each production. The look of a brochure or poster etc. has to be carefully considered, as it characterises the organisation and establish its public image.

The importance of webpages has increased enormously for outreach offices. The internet is now *the* standard tool for distributing scientific information. This is practised extensively at HEIC, especially for the distribution of communication products that are developed in the office to be available on the web for everybody.[15] But HEIC also uses other methods, for example the latest DVD produced at HEIC appeared on the so-called “Video-on-demand” pages on the web, where the movie can be downloaded by the user directly. Similarly, the files for printed material are available to everybody on the homepage and can be reproduced by anyone with the appropriate technology.

5.2. Distribution

To decide whether a new discovery or finding by a scientist is interesting enough to publish requires careful consideration and with the help of the following guidelines. The general guidelines used by the Space Telescope Science Institute deem scientific findings newsworthy if they:

1. Represent a major discovery of a new phenomenon or class of object.
2. Decisively settle an area of controversy in astronomy.

[14] Christensen, p.30.
[15] Christensen, p.31.

3. Present a new mystery or unexpected new complexity to some known phenomenon (e.g., the rings around supernova 1987A).
4. Represent a significant step forward in a specific research area (e.g., a refined value for the Hubble constant).
5. Represent an incremental yet important knowledge gain in a given area (e.g., detection of a white dwarf sequence in globular clusters).
6. Set a new astronomical record or benchmark, or possess an element of novelty (e.g., the most distant galaxy or hottest star).
7. Provide images that are visually striking and have aesthetic appeal, even though there is no new science (e.g., the interior of the Orion nebula).
8. Deal with unpredicted, transient events (e.g., nearby comets, a nova, or changing weather on a planet).
9. Provide new insight into one of the following popular astronomical topics: cosmology, extrasolar planets, black holes, dark matter, solar system objects, distant galaxies, Earth's evolution, fate of the Sun, or the possibility of extraterrestrial life.[16]

This list can be extended by additional guidelines used at HEIC:

1. News or discovery connected to an interesting person (e.g. a Nobel laureate)
2. If it deals with an ongoing and much-debated conflict or controversial subject[17]

HEIC sends out several printed News Releases every year to about 720 recipients, who include mediators, decision makers and other scientists.

At this point I would like to compare the procedure of releasing news of HEIC with the ESO.

ESO takes the view that sending out hard copy Press Releases to journalists is overvalued. Analysing the results from the survey described above (Figure 3), ESO recognised that the internet is the best, fastest, easiest and most popular means of transferring information nowadays. About 450 hard copies of each release are sent out, not to the actual target groups wholesale, but rather to a few selected people on request (for instance elderly, retired persons, institutes which use the pictures, etc.). It is also possible to curtail expenditure by printing fewer editions, but then in a greater quantity.

HEIC always sends out Press Releases to journalists with an embargo. This gives journalists time to write their articles and gives them the feeling of being important to the organisation and in the favoured position of receiving information in advance. Journalists are enormously

[16] http://outreachoffice.stsci.edu/news/newspolicy.shtml#a, 20.08.2005.
[17] Christensen, p. 38-39.

attracted by embargoed Press Releases as they appear to have a higher importance and hence are more likely to attract recognition. To save time and money Press Releases can be uploaded to a webpage with an embargo and in most cases the embargo will be respected.
As ESO and HEIC are organisations operating all over Europe, it not possible to establish personal contact with the journalists or other important target groups, even though this is the best way to provide information to interested people. The effort required is too demanding considering the small staff and the language barriers; so personal contact has to be concentrated on a local basis.
In ESO's experience printed products are no longer important for the press where everything is already done electronically. For all other target groups, printed products are still and will always be of enormous importance.

5.3. Evaluation

Evaluation in science communication means measuring the success of outreach projects. To evaluate the results of science communication is a difficult and extensive task often with little real return in terms of knowledge acquired.
Collecting quantitative information is the usual way to evaluate the success of a product or a project. Written articles, TV shows, reports on the radio and so on that mention the parent organisation are counted and collected to give an overview of how often the organisation is named and therefore how well known it is in the public sphere. These numbers will reflect public interest in the organisation and show whether the communication office has worked well in terms of making the press aware of the organisation and its products. Unfortunately, these numbers don't say anything about the slant or reception of an article - if it was a positive or negative, and how it was understood by the public. To obtain this kind of detail it is important to maintain daily contact with representatives from each target group (journalists, non-scientists and scientists, etc.). These people are able to say if a release or product worked out well or not.
The fastest way to find out the latest media resonance is to search the internet and look for the latest publications (for example on www.news.google.com). Every article, video, etc. should be collected and stored as press clippings.

5.3.1. Evaluation of Press Releases on the web

Although there are other more precise methods of evaluation, for example questionnaires, they are rarely undertaken, as they require a major effort. At HEIC, questionnaires are sent out with the press releases. This does not create additional despatch costs and has proved itself to be a very successful method, delivering numerous answers and new information from journalists. But

it still needs staff and budget to realise it and this has to be considered carefully, (see more in chapter 7.3).

Web statistics can track the popularity of the organisation's homepage continuously and will display the number of visits and downloads in the form of diagrams or tables. Figure 5**Error! Reference source not found.** shows the statistical impact of press releases published by HEIC on its homepage arranged chronologically, showing how often each release was clicked, giving a measure of the awareness and interest for each news release on the internet. The general trend line is rising continuously, and the latest Releases were notably very successful in terms of web hits.

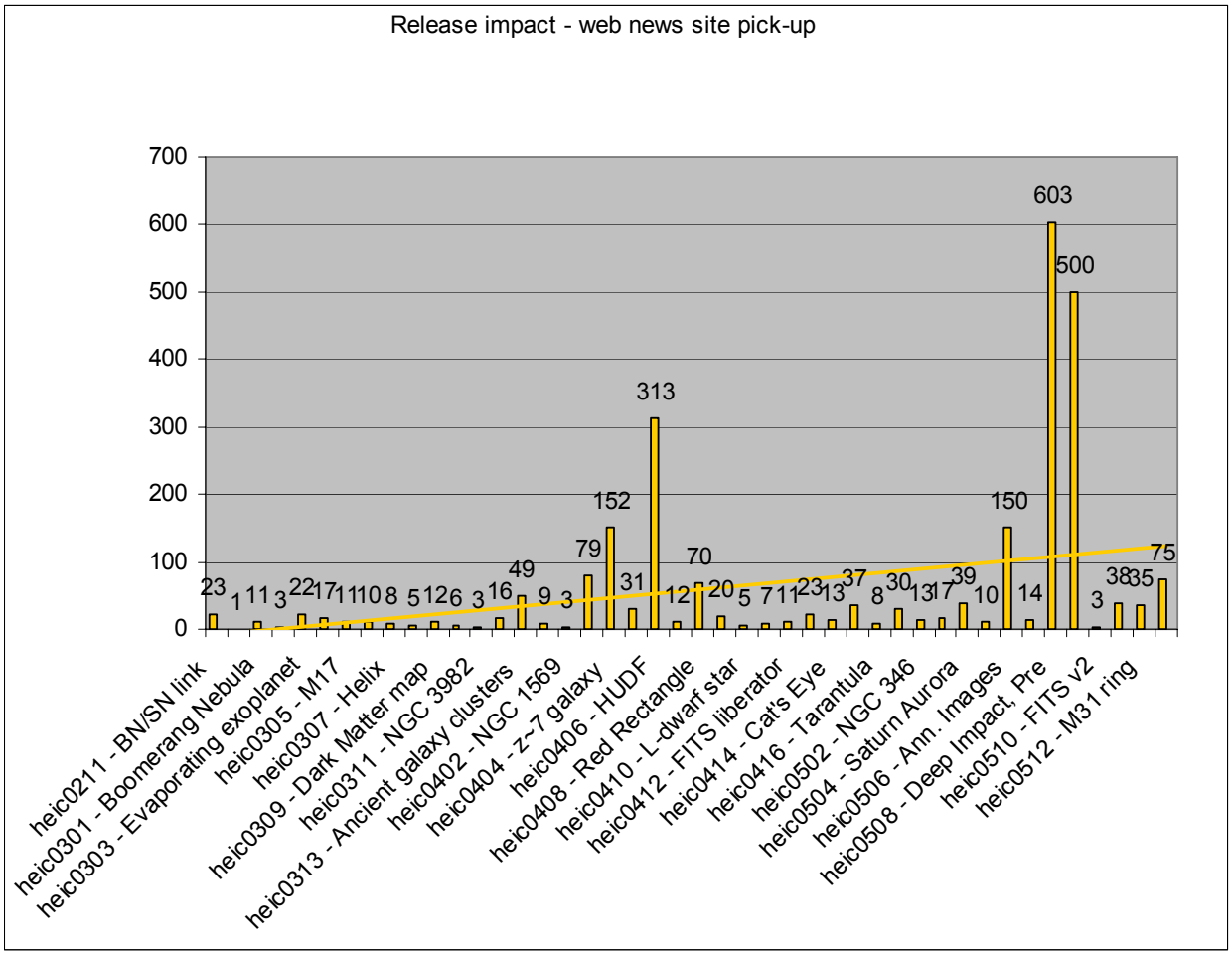

Figure 5: Release impact on the web for each Release since Nov 2002 (Source: Hubble European Space Agency Information Centre, Munich.)

5.3.2. Evaluation of visitors on the HEIC homepage

HEIC has also established a graph showing how many visitors, independent of news releases, have visited the homepage, shown in**Error! Reference source not found.**. It is clearly visible

that the number of visitors has increased enormously in the past three years from about 5,000 to 105,000. Single explosions in visitor numbers are due to certain events, for example: NASA's Deep Impact spacecraft's encounter with comet 9P/Tempel 1 at the end of June 2005. Positive statistics like this prove to a department like HEIC that its strategy is the right one.

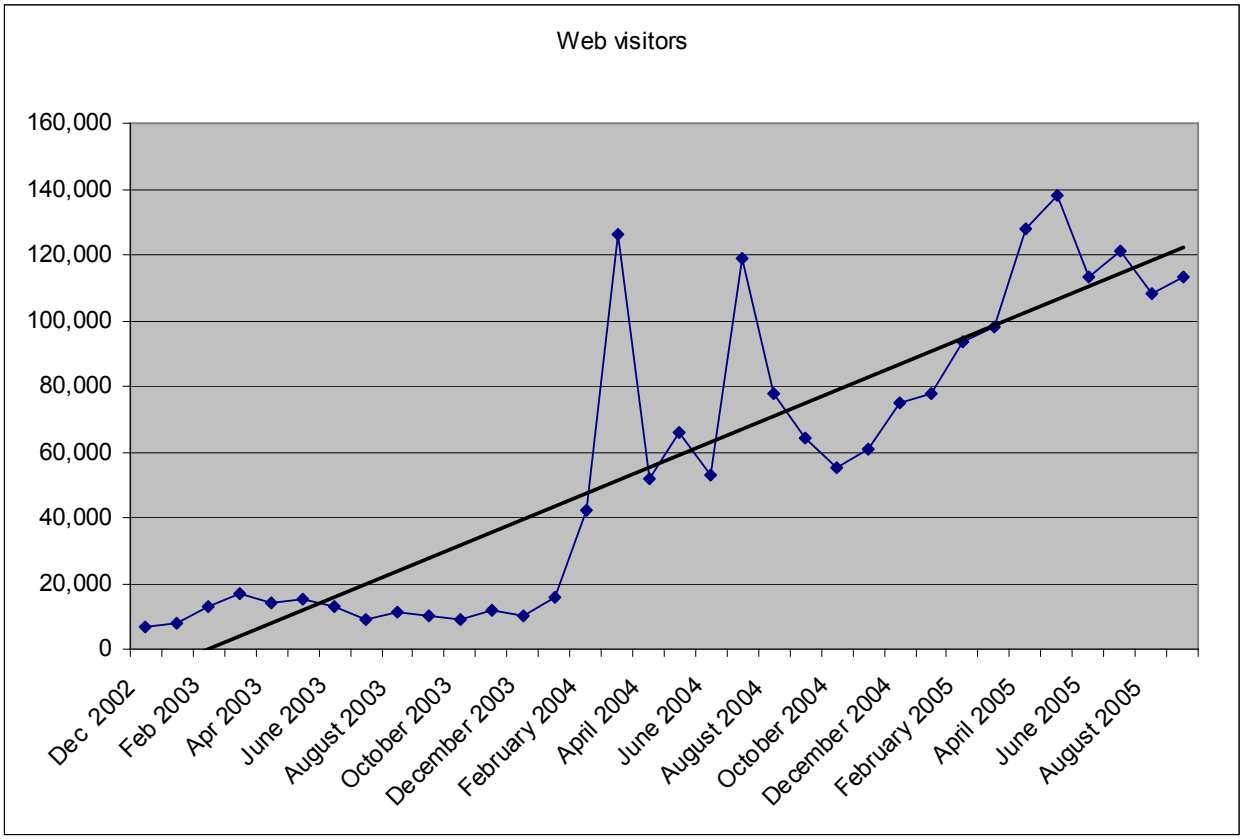

Figure 6: Visitors on the Homepage of HEIC showing the general trend (Source: Hubble European Space Agency Information Centre, Munich.)

6. Recommendations

There are some improvements concerning the distribution strategy that I can recommend for implementation as a result of my analysis and research at HEIC .

1. Webshop:

This uses commercial means and methods to distribute existing and new printed products as well as merchandising items. This has several aims:

- to make existing products more visible
- to make acquisition easy (in this case by ordering)

- to give a higher ‘value’ to the products by selling them at a price
- to reduce the financial risk involved in producing a given product by having a (nearly) guaranteed volume sold of a given product This in turn makes an expansion of the product portfolio possible.
- to use the sale of products as a means of evaluation of the product.
- to improve name recognition by merchandising as well as distributing free products (see Section 7.1)

2. Advertising on the web:

This can lead to a more widespread awareness of the homepage, brand, institution, products etc. by a fast and relatively cheap means. The description of advertising on the web is connected to that of the webshop in this report. If a webshop is implemented it should be advertised preferably on the web, because of the global reach, with a direct link to the webshop. (See Section 7.2)

3. Printed products for media/educators:

As described in Section 5.1, the most important addressees for HEIC are the media and educators as they spread information to numerous other people who might not otherwise come into contact with the topic. These persons should be given free access to general information, news releases, images and other printed products. The easiest way to make products available to these mediators is to implement a special order form on the homepage where printed products are described and can be ordered for further use.
This recommendation was implemented as part of the webshop (see Section 7.1.2).

4. Questionnaire for News Release recipients:

As HEIC sends out thousands of news releases each year to hundreds of users/readers it is important to be up to date with the addresses and the interests of the recipient. This can be done with the help of a questionnaire sent out to the release recipients. (See Section 7.3)

5. Homepage statistics:

One way to know whether a homepage is successful and popular is to measure the time each user spends on the homepage. Implementing these measures is a very labour intensive task that requires intensive expert work and was not undertaken at HEIC.
Susan Haigh and Janette Megarity point out that such statistics are not necessarily a reliable source of information:

"User sessions" are calculated by some log analyzer products by tracking requests received from an IP address until a period of inactivity (say 30 minutes) indicates to the software that the "session" has ended. As this calculation is based on two unsound assumptions - firstly that a host corresponds to an individual, and that the individual would not normally pause (whether to go to another site or another task) within a site visit - user sessions are, at best, gross estimates. Secondly, that average page views per session, average length of session, average length of a page view, top entry and exit pages, single use pages, and top paths through a site can be calculated: These statistics are derived from the artificial construct of a "user session". Also, because more frequently requested files may be obtained from a cache, the first file logged as requested might, in fact, be in the middle of a user's actual site visit. [18]

6. Link for comments regarding the homepage:

Some homepages have a comments link, where users can give their comments on the homepage concerning its overview, comprehensibility, simplicity, etc. The comments can then be used by the web publisher to change or improve sections of the homepage.

7. Discussion-platform on homepage:

A discussion-platform or chat-room on the homepage can give the public better access to the science by promoting discussion between users as well as with scientists, giving the public the opportunity to pose and discuss questions directly with scientists. This also gives the scientist direct contact with the public and may serve to help make science more accessible to non-scientists. This has yet not been implemented at HEIC because it is a very labour intensive task that scientists would have to undertake in addition to or at the expense of their actual work.

8. More eye-to-eye contact between scientists and the public:

It is often said that scientists concentrate only on their work and that understanding what is done is reserved only for scientists as well. Public appearances by scientists and access to their work can help to dispel this perception. There are many ways in which scientists can appear in public to explain their work, for instance by giving speeches, organising workshops, appearing at an open-house-day, etc.

For example these kinds of public events where non-scientists can meet the experts are organised under the name “Wissenschaft im Dialog” (Science as a dialogue) in Germany. Similar events take place in Britain and France. Unfortunately these events will only reach the local public who can make the journey to the event and, just like a discussion-platform on the

[18] http://www.collectionscanada.ca/9/1/p1-256-e.htm, 16.08.05.

web, this is a very labour intensive type of public relations, especially for the scientists. But there is no better way of improving and maintaining the relations with the public.

9. Further use of the images:

The Hubble images produced by HEIC can be sure of a big following. At present they are published free on the web for download and can be used by anybody for any purpose.
HEIC could control this, especially the use by non-scientific organisations or persons. Images of stars and galaxies are very popular and can be used for all kinds of events. HEIC could exploit this fact more and try to offer images and other information to people and organisations not directly related to science or astronomy with the intention of becoming better known in these sectors.
The images could, for example, be used at events for children (such as children watching stars in a dark-room), or they could be exhibited at universities in connection with other related topics like space travel or Einstein, or on numerous other occasions.

10. Membership Club for image creators:

Pictures taken by the Hubble Telescope can be used by everybody to produce new coloured images. One programme developed and used by HEIC is “FITS-Liberator”, which can be downloaded from the web for private use. Image creators who have used the FITS-Liberator can upload their own images to the HEIC homepage and distribute them by this means. The programme is used almost exclusively by astronomy-insiders (hobby-astronomers and experts), so a club for FITS-Users is a possibility. For example, anybody who creates more than four images per month could become member or those creating the best images, etc. The membership could then be supplemented by club T-Shirts or baseball caps or something similar, flagging the wearer as a member.

11. Radio distribution

Although astronomy is clearly a visual science, there are still some arguments for radio distribution and advertisement. Radio is not the optimal means to spread astronomical news and background information, as obviously no images can be shown, but radio advertising is a very popular and far reaching option.

Part III. Implementation

7. Implementation

In the following chapters I will describe how some of the recommendations listed in chapter 6 were implemented during my internship.

7.1. Webshop

HEIC offers a wide range of products, for example brochures, posters, DVDs, CDs, etc., which are for the public. At present these products can either be downloaded from the web (printed products only) or be picked up directly at the office. This situation had to change so we decided to implement a shop where anybody could access the products. This kind of commercialising is known as e-Commerce.

As the potential customers are spread over all of Europe, the best way to reach them and enable orders from anywhere is to implement the shop on the web. The idea was to make our products accessible to everybody in Europe. by distributing it via a border-crossing media. The steps necessary before an internet shop can be established will be described in the following section this process using our experience at HEIC as an example.

7.1.1. Merchandise

We decided to introduce a totally new type of product to the HEIC product portfolio: merchandise.

Merchandising products are usually used by commercial industrial or service companies as gifts to attract customers and keep them loyal. Research institutions can use them as well; possible products could be pens, posters, DVDs, lanyards, stickers, etc., or more exclusive articles.

7.1.2. Selling science communication products

One might argue that intergovernmental organisations like HEIC and ESO should not sell items, but as they have low budgets and cannot afford to give away products as presents for free. Everything produced by scientific institutions like HEIC should be available to all. The optimal solution would be to send out whatever is desired to individuals. This is far too expensive, so the institution has to charge a small price for handling and shipping. It is then up to the customer to decide whether to pay a small amount for the final receipt of the information/product. For the merchandise products the same argument applies, the customer decides if he wants to have some kind of keepsake or evidence of loyalty for a small financial expenditure.

Products can be sold on the web (e-commerce) or at events, for example, on open house day, at an information stand. On occasions like these some of the cheaper products could be given away for free as well, for example, articles like brochures, books, CDs etc. These should be given away for free to journalists and other mediators and VIPs anyway because they are invaluable to the distribution process.

7.1.3. Product line

First, it has to be decided what products are to be offered. HEIC chose to start with a small range of good quality products at a moderate price to test the demand without risking too much. Pens, stickers, pins, lanyards, posters, DVDs, postcards and coffee mugs constitute the first range of merchandise articles. These are to be sold in an internet shop on the HEIC homepage and additionally advertised on the web (see chapter 7.2). The interests of different target groups can be addressed by separate items, for example lanyards designed especially for young people. This might improve links with the general public, but the success of this project remains to be seen as it is still in its infancy.

7.1.4. Procurement and Production

Procurement is the actual process of buying the products. It is about reducing the risk of spending too much and ensuring that you will get the right product at the right price. Producing and procuring a physical product such as a coffee mug is a highly iterative process.
Where the products should be ordered and produced has to be carefully investigated. Several quotes from different companies have to be requested and compared with each other before the decision can be taken and this can be time consuming. One has to be constantly aware of the production parameters. These depend on the product type and supplier specifications, i.e. which colours can be used, available formats and so on etc.

7.1.4.1. The Procurement Process

The procurement process always starts with an idea about what should be ordered. Normally this is a rather rough idea, as for example in our case, where we began with simply wanting to have merchandise products.
First of all we had to decide in general what kind of products our merchandise might include and then on the products in more detail. Then the graphics designer drafted some examples of how the items might look with the new logo and in different colours. We requested initial quotes from merchandise producing companies and collected rough price examples based on these

prototypes. This gave us an idea of approximate costs and we restructured our product range to match the available budget, deleting some products or changing details, etc.

Our graphics designer made new and more precise drafts based on the technical specifications set by the companies that we then submitted for new quotes. In general the price increased as our designs became more specific.

The second round of quotes decreased the number of possible co-operators from six to four. Each stage of the process involved constant contact and consultations between HEIC and the possible contractors about specifications and prices. Our final decision was depended not only on the price, but on the quality of the items, the time of production, as well as the readiness of the supplier to co-operate with us and the time period in which questions were answered and offers made. The final designs and quotes were then officially requested by the contracts and procurements department at ESO to compare the prices for one last time and to select the best contractor. The initial requests sent out by HEIC could be seen as preliminary work for the contracts department.

This iterative process could, in principle, run ad infinitum, but manpower resources and deadlines force convergence on a final decision. It is important to prepare the workflow of procurement in such a way that future work can be carried out smoothly. The choice of a supplier is critical - you have to be aware of the service offered in terms of reproduction of items or help if something wouldn’t work. One has to take care that all items offered at the webshop already exist as final products or can be produced in a few days for immediate distribution.

7.1.4.2. Price/unit

As we recognised by comparing the prices it makes a significant difference to the unit cost if a greater quantity of the individual product is ordered. An important factor in setting the budget is that the more you order the cheaper it gets.

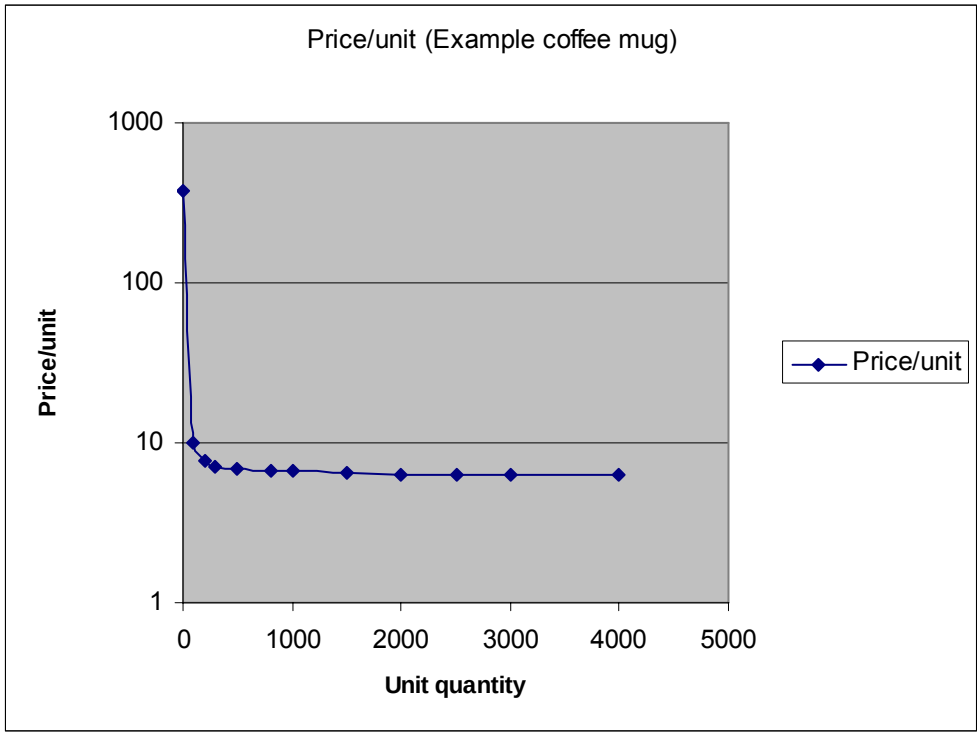

Figure 7: Graph showing the change of the price/unit if higher quantity is ordered (Source: own development)

Figure 7 shows the unit cost as a function of the number of pieces ordered using the example of a “coffee mug” as the product, with price examples received from a merchandise producing company. Ordering only one item is extremely expensive; all additional costs (i.e. print colours, production of a draft, etc.) have to be covered in making this single item and cannot be spread over several items. The more items you order the lower the additional costs per item and therefore the individual price per item. The price for one hundred coffee mugs is 10.09 EUR/item, but if you order 2000 coffee mugs the price drops to 6.61 EUR/item.

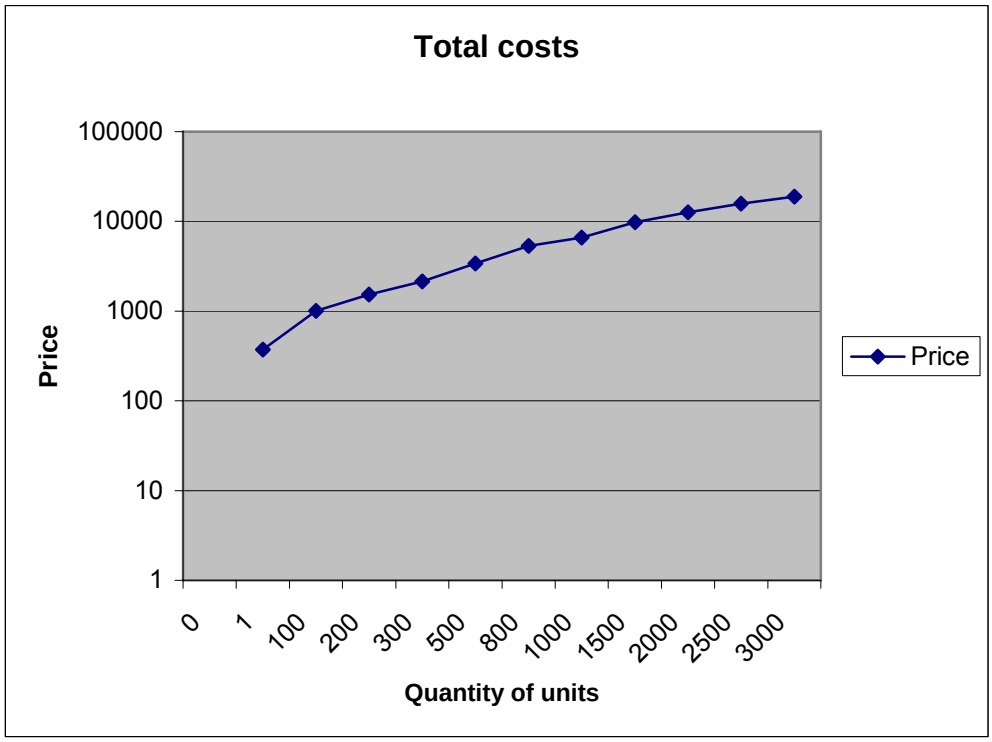

Figure 8: Graph showing the increase in price per quantity of items (Source: own development)

Error! Reference source not found. shows the price for the whole order as a function of the quantity ordered. The total price for an order rises, the more items are ordered. The curve flattens as more items are ordered, showing that ordering more reduces the price for each item and therefore for the whole order, so the total cost doesn't rise in proportion to the quantity.

As ESO is a public institution the intention is not to make a high profit though the sales and only the production and handling costs are charged.

7.1.5. Introduction of a new brand

Along with the new products we have developed a new logo design (see **Error! Reference source not found.**) that we hope will turn HEIC/ESA/Hubble into a well-known "brand". The logo was designed to make an eye-catching and attractive symbol that sticks in the memory and is easily recognizable. The conditions were to include the word "Hubble", the ESA Logo and the HEIC homepage as well as typical colours that are associated with space. The aim is to evoke an association with Hubble and the HEIC each time the logo is seen.

Figure 9: New Logo designed by graphics designer Martin Kornmesser at HEIC for the products sold in the webshop. (Source: http://www.spacetelescope.org/bin/logos.pl, 20.09.2005.)

7.1.6. Shipping costs

The prices for each product to be sold are set to include the shipping costs as well as the actual product price.

Clear shipping costs demand a simple system that gives both customer and vendor an overview of how high the shipping costs for each order will be.

Five different systems were looked at closely before we made a decision:

a. Add the product price to the actual individual shipping price (charged by the Deutsche Post)

b. Charge a certain percentage of the product price:

   Shipping in Germany charged at 15 %, Europe 33 % and World at 60 % of the order.

c. Set a fixed price for each level of a defined price-echelon:

Order amount	Germany	Europe	World
5 EUR	2,-	4,-	7,-
>5 EUR	3,-	6,-	9,-
>10 EUR	4.50	8,-	11,-
>20 EUR	5,-	9,-	12,-

d. Charge the actual shipping cost of the first product (prices by the Deutsche Post), and each additional item incurs an additional fixed charge; we started with 2 EUR per additional item.

e. Set a fixed price for each level of a defined weight-matrix

Weight	Germany	Europe	World
0 – 20 g	0.55	0.95	1.55
20 – 100 g	1.44	2.00	3.00
101 – 250 g	1.44	4.00	7.00
251 – 500 g	2.50	6.50	11.00
501 – 1000 g	3.00	8.00	12.90
1 – 4 kg	4.30	9.00	12.90
Above 4 kg	5.60	17.00	30.00

To compare the different schemes for charging shipping costs we calculated prices using a couple of sample orders. We simulated different shopping situations, for example, small single products (i.e. one brochure), packets of two or more products (i.e. one DVD, one book and one postcard), big packets (i.e. one poster), etc., to have different price examples for each case.
After gaining a general overview of how the actual prices for shipping vary, we decided to set a minimum order of ten Euros. Shipping and handling costs for orders priced any lower amount to at least 50% of the total, which is unacceptable.

Table 2 in the Appendix shows the shipping prices separated into the regions of Germany, Europe and World. The letters **a, b, c, d** and **e** refer to the five systems described above. The simulations have then been transferred to the three graphs below, showing the comparison between the actual shipping costs and the costs calculated in the simulation for the five trial schemes. The graphs include the trendline that matches actual to predicted prices (y=x) to make it easier to see which of the five systems fits the actual prices best. Figure 10 represents shipping costs in Germany, Figure 11 in Europe and Figure 12 shipping costs in the rest of the world.

By comparing the graphs we noted that system **a** fits the best to the actual prices, but because of its complexity (requiring individual pricing for each product) we opted against it. Instead we chose system **e** as the best solution: on average it fits best with the actual shipping costs; points that are below the line can be balanced by points that lie above the actual costs. System **e** can be implemented fairly easily on the web and is comprehensible for the customer.

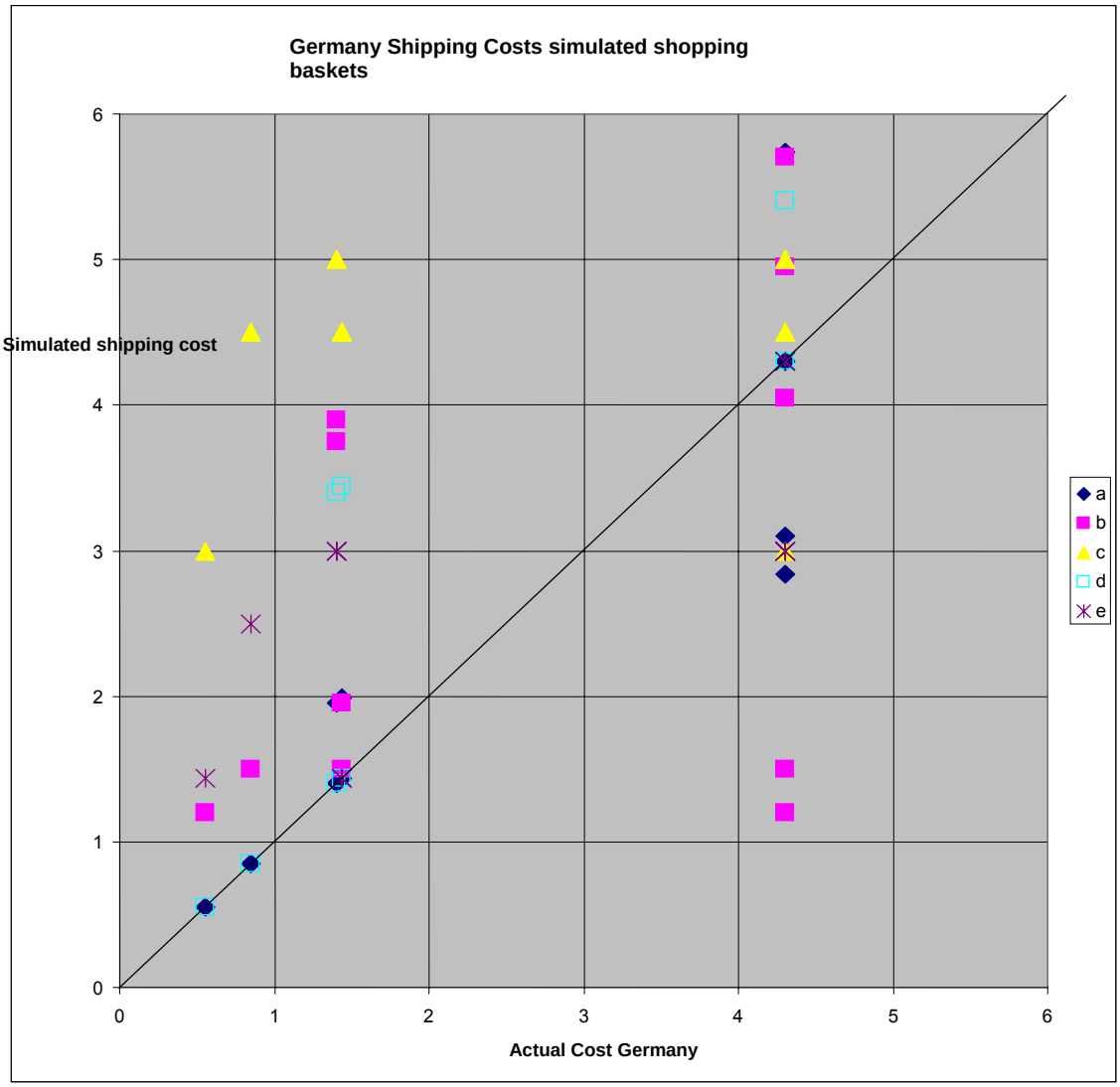

Figure 10: Shipping cost simulation for Germany showing how each of the five systems fits to the line y=x (charged shipping cost = actual cost). (Source: Own development)

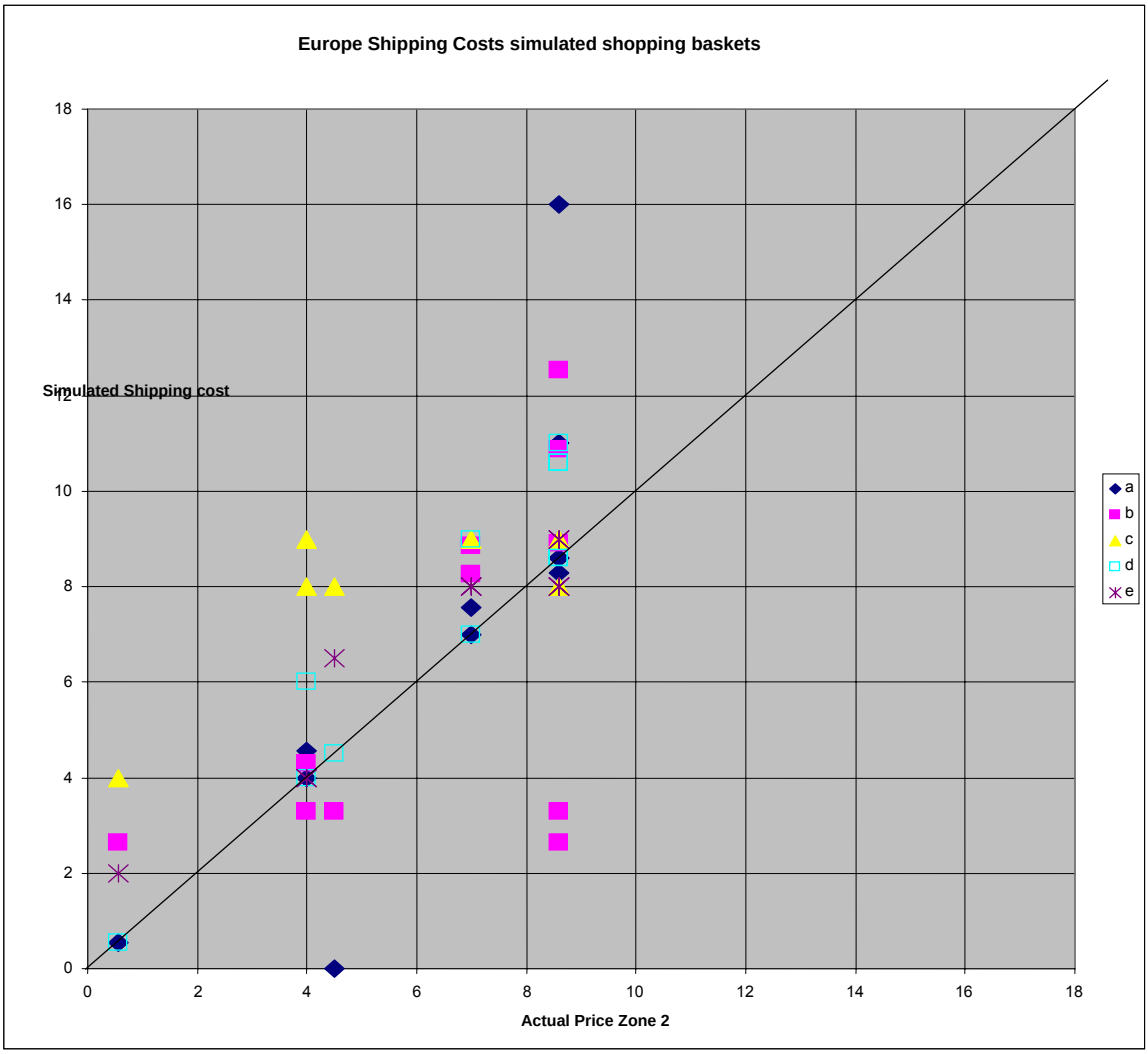

Figure 11: Shipping cost simulation for Europe showing how each of the five systems fits to the line y=x (charged shipping cost = actual cost). (Source: Own development)

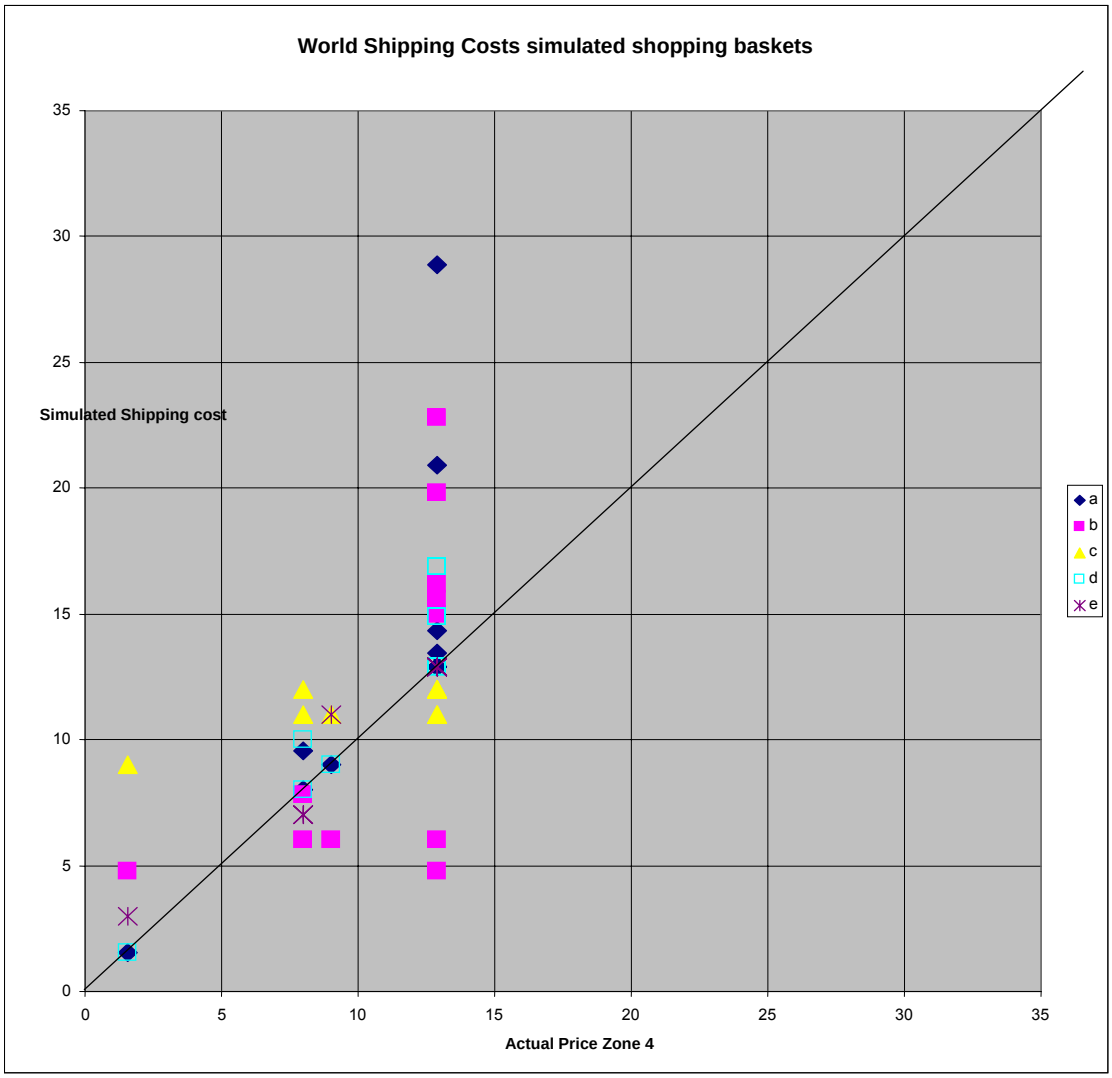

Figure 12: Shipping cost simulation for World showing how each of the five systems fits to the average trend line. (Source: Own development)

By calculating the standard deviation of the five shipping cost systems from the line y=x, which indicates perfect correspondence between actual and simulated shipping costs, we could see which system fits best with the actual prices. The results are:

	a	b	c	d	e
Germany	0.75	1.73	2.47	1.25	1.12
Europe Zone 1	2.36	2.95	2.60	1.41	0.93
World Zone 1	5.43	5.27	2.95	2.00	0.86
Average	**2.85**	**3.31**	**2.67**	**1.55**	**0.97**

Table 1: Estimate of standard deviation for y=x

It is clear that system **e** with a standard deviation of 0.97 was the most appropriate. The most appropriate scheme will vary from organisation to organisation depending on the shipping destinations and the products.

7.2. Advertising on the web

The target set by HEIC is to increase the number of individual users of the homepage of HEIC by 50 % over the next three months. It is thought that this can be achieved by advertising on the web. The main impetus was the new webshop; HEIC decided that if a new webshop were to be established some kind of advertisement was necessary to publicize it successfully. Ads on the internet are seen by more people than anywhere else and are therefore very effective. The advantage is the direct link to the chosen homepage, i.e. for HEIC the webshop. The following section describes how such an ad can be installed with Google AdWords.

7.2.1. Example AdWords

Advertisements placed on the Google Search homepage is one way of making people aware of the new products that are being offered on the web by HEIC. The popular "Google AdWords" site enables companies to advertise their products or homepage in an advantageous position on the Google Search Site, increasing the chances of being clicked. To be clicked means that a person clicks on the link on the Google page connected with your homepage and then hopefully his or her interest will be captured by your homepage. Your ad appears on the page as soon as a user enters keywords in the search field that you have decided should be connected with your ad. The link/ad itself should contain keywords referring to your products or homepage, making it attractive for the user to click on the site. Figure 13 shows how to create an ad and Figure 14 shows the ad as it appears on the Google Search page.

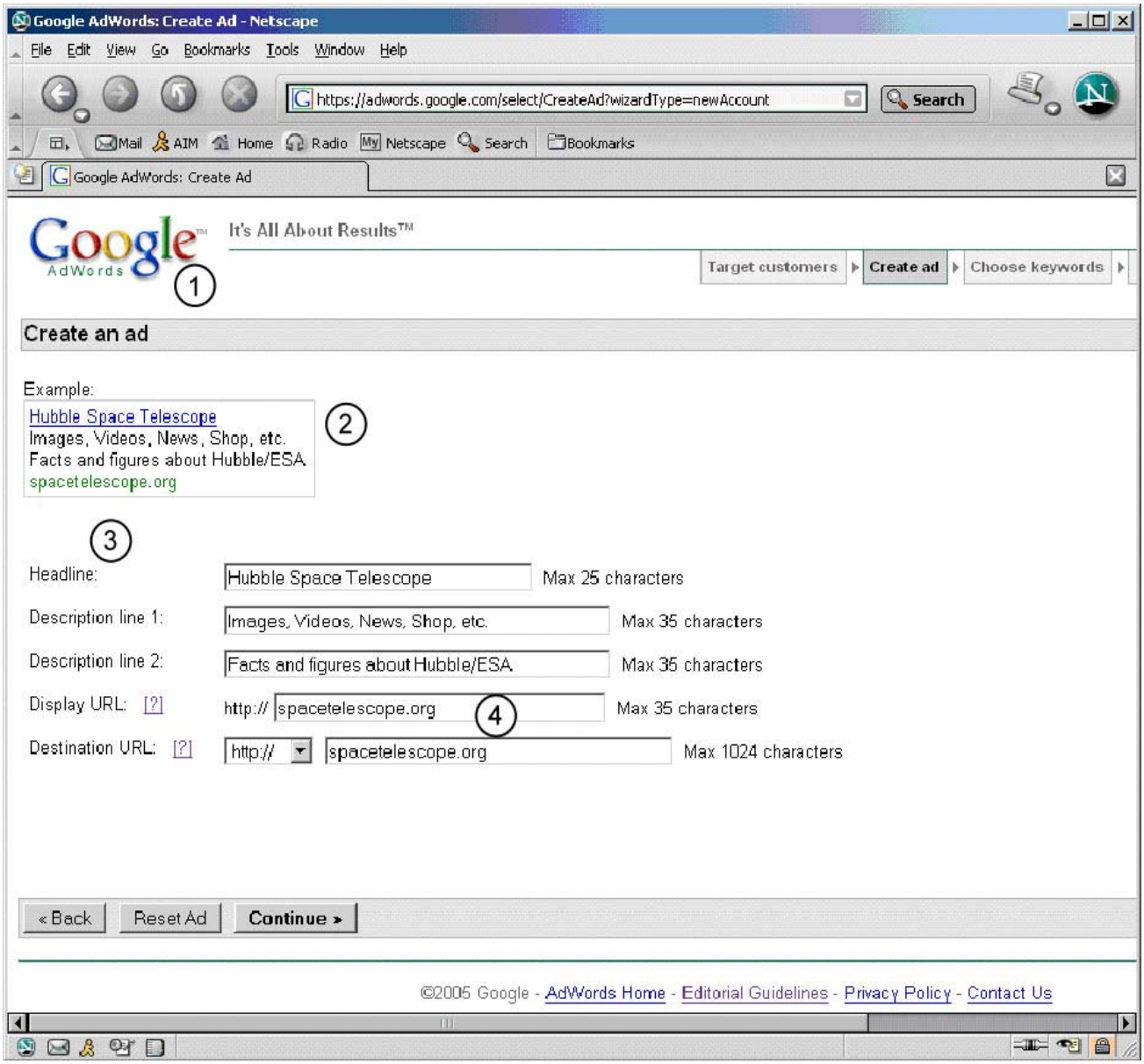

Figure 13: Example for creating Google Advertisement (Source: https://adwords.google.com/select/CreateAd?wizardType=newAccount, 10.09.2005.)

Explanation:

1. Google AdWords Homepage
2. Possible image of the appearance of an advertisement (in this case for the HEIC Homepage) on the Google Search Site
3. Headline and descriptions used in the ad
4. Link to the desired homepage

Figure 14: Example of Google AdWords on the Google Search Homepage on the right hand side (Source: http://www.google.com/search?hl=en&q=hubble&btnG=Google+Search, 14.08.2005.)

The costs of Google AdWords are borne by the company. Different rates determine the frequency with which the advertisement appears and its position on the page – the higher up the page the more favourable and expensive. The costs-per-click can vary between 0,05 EUR and 100,- EUR,. If there are only a few advertisers connected to the keywords you chose, then competition is poor and well-placed ads are relatively cheap. Google uses the number of keywords, the keywords themselves and your selected price-per-click to estimate how often each keyword will be clicked and then calculates how much you will have to pay on average per day. It is also possible to set a daily limit and as soon as this limit, for example 20,- EUR, is reached, the ad will no longer appear on the Google Search page and no further costs will accrue. The prices can be changed instantly by the advertiser from his personal account, where

he can also follow the current clicks and billings. See Figure for an example of calculating the prices.

The advertiser has the advantage that he sets the prices, there is no monthly minimum fee, no costs if the ad is not clicked, and the flexibility to change the ad or the prices, giving an ongoing control over the costs, with monthly billing that includes user statistics for the billed time period i.e. how often which keyword was clicked, etc.

This method enables anyone to advertise on Google AdWords regardless of their budget.

maximum CPC: 1.00 Get New Estimates

If you enter your own maximum CPC, use the total cost to help determine your daily budget.

Estimates for the maximum CPC: €1.00 EUR

Keywords	Avg. Position	Clicks / Day	Cost / Day	Avg. CPC	Status
Overall	**1.3**	**106.3**	**€19.76**	**€0.19**	-
ESA	1.0	24.0	€2.11	€0.09	On hold
european space agency	1.0	1.0	€0.05	€0.05	On hold
hubble	1.3	57.0	€11.38	€0.20	Normal
hubble images	1.6	2.0	€0.49	€0.25	Normal
hubble pictures	1.6	3.0	€1.01	€0.34	Normal
hubble space telescope	1.4	7.3	€1.67	€0.23	Normal
space images	1.4	5.9	€0.93	€0.16	Normal
space shop	1.1	2.1	€0.59	€0.28	Normal
space telescope	1.6	4.0	€1.52	€0.38	On hold

Estimates for these keywords are based on clickthrough rates for current advertisers. Some of the keywords above are subject to review by Google and may not trigger your ads until they are approved. Please note that your traffic estimates assume your keywords are approved.

Figure 15: Calculation example with the keywords chosen at HEIC (Source: https://adwords.google.com/select/CreateAdInput, 10.09.2005.)

7.3. Questionnaire for News Release recipients

On my recommendation a questionnaire was sent out to the recipients of News Releases. The aim was to update the address database with the correct contact data and contact persons to ensure that the release reached the right people and whether, most importantly, they wished to continue to receive the releases.

7.3.1. Implementation

We decided to send out the forms together with a news release. If the recipient wished to continue to receive news releases they had to return the completed form with up to date contact data, either by post, fax or email, using a specially placed link on the HEIC homepage. The questions had to be easy to understand, to answer and for us to evaluate. We finally settled on five pieces of information we wanted to know. Firstly, whether news releases should still be sent, secondly, how often the information was used; and thirdly, what it was used for. In addition we requested up to date contact data and added an extra line for comments, suggestions and complaints. Figure 15 shows the final questionnaire that was sent out on 3rd August 2005.

7.3.2. Result

The first answers arrived the following day, while others took three weeks or more. This made the evaluation process difficult because we had to wait for all the responses. Eventually about 300 out of 720 recipients had answered and we were able to update our database and see in what way and how often our information was used. This information can be used to target certain users in future, for example, to inform educators if new educational material is published.

A decision had to be taken about what to do with contacts who did not answer. The most radical solution would have been to simply delete them from the news release recipient list. However we found that there were too many addresses that are very important for HEIC, for example press reporters, big planetaria, etc. So we decided not to delete everybody but instead to look through the no responses and only delete those who were not very important as mediators for us, i.e. teachers, small planetaria or private users. Those to whom we decided not to send news releases anymore were then set to “dormant”, meaning that we could still see them in the database. This system enabled us to delete about 280 recipients from the active list, but gave us the option of reactivating them at a later time if necessary.

HUBBLE
European Space Agency Information Centre

c/o ST-ECF
ESO, Karl-Schwarzschild-Str.2
D-85748 Garching bei München,
Germany
Telephone: +49 (0)89 3200 6306
Cellular : +49 (0)173 38 72 621
Telefax: +49 (0)89 3200 6480
hubble@eso.org
www.spacetelescope.org

Thursday, 08 December 2005

Dear Sirs,
We are updating our mailing list. With your help we would like to optimize the distribution of our News and Photo Releases. If we hear nothing from you, we assume that you are no longer interested in receiving our Releases and your name will be taken off the distribution list.

If you want to continue receiving News and Photo Releases from ESA/Hubble please either:

1. Fill in the form on our homepage: **www.spacetelescope.org/q**
Or 2. Fax the form below to:
+49 (0) 89 320 2362
Or 3. E-mail the content to
distribution@spacetelescope.org

1. Would you like to receive News and Photo Releases from ESA/Hubble:
□ In printed form (as now)?
□ In electronic form by E-mail?

2. How often do you use the information given in the News and Photo Releases?
□ Always □ Often □ Sometimes □ Rarely □ Never

3. What do you use it for?
□ Press reporting □ Education □ Exhibitions etc. □ Background info □ Other: _____

4. Comments:
_____

5. Name: _____

6. E-Mail: _____

If your name and address on the label are not correct, please correct it here:

Organisation	
Department	
Contact Person	
Address	
City/zip code	
Country	

Figure 15: Questionnaire sent out to all News Release recipients together with a Release on 3 August 2005

Part IV. Conclusion

8. Conclusion

As always, theory, as presented at university, is not similar to the practical work. Nearly everything at the Hubble European Space Agency Communication Centre is carried out spontaneously, following instinct and experience. That all the processes were on computers or the internet was particularly surprising. The internet is the main means of communication both for disseminating information or personal communications by far. This requires IT experts who can install, update and supervise the homepage and many other kinds of data. Personal eye-to-eye contact is, unfortunately, rare as the contacts are widely dispersed. Another point not mentioned in the literature is the importance of the graphic designer. This may be especially important for institutions that deal with astronomy, where images make up the main component of communication with the public. Without great efforts in the graphic area the Hubble Space Telescope would never have become as popular as it is now. Most people only know the Hubble images, but these are exactly what brings Hubble closer to non-astronomers and are therefore essential.

Distributing background information and news is a far more difficult challenge for HEIC as there are fewer interested parties. The main challenge lies in making the science understandable for everybody, not only the experts. It is always easier to' preach to the converted' than to 'convert' innocent laypeople.

During my time at HEIC I had the chance to learn and experience nearly everything a science communication office deals with. Fortunately, my ideas were taken into consideration as well and together as a team we were able to implement projects like the webshop.

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Appendix

Table 2: Simulations of shipping costs for different products, actual prices calculated using the prices of the Deutsche Post (data in EUR)

	Sales Price	Type of Freight	Germany	Simulation					Europe		Simulation					World		Simulation				
			Actual Price	a	b	c	d	e	Zone 1	Zone 2	a	b	c	d	e	Zone 3	Zone 4	a	b	c	d	e
Book 1 Hubble – 15 Years 760 g	25	Book	1.4	1.4	3.75	5	1.4	3	7	7	7	8.25	9	7	8	12.9	12.9	12.9	15	12	12.9	12.9
Edu 2 ESO/ESA Exercise Series –All 480 g	10	Book	0.85	0.85	1.5	4.5	0.85	2.5	4.5	4.5	4,5	3.3	8	4.5	6.5	9	9	9	6	11	9	11
DVD 1 Hubble VIP 153 g	10	Standard	1.44	1.44	1.5	4.5	1.44	1.44	4	4	4	3.3	8	4	4	8	8	8	6	11	8	7
Merchandise Mug/T-Shirt ~ 500 g	10	Päckchen	4.3	4.3	1.5	4.5	4.3	3	8.6	8.6	8.6	3.3	8	8.6	8	12.9	12.9	12.9	6	11	12.9	12.9
DVD 1+ T-Shirt ~700 g	27	Päckchen	4.3	5.74	4.05	5	6.3	3	8.6	8.6	8.3	8.91	9	10.6	8	12.9	12.9	20.9	16.2	12	14.9	12.9
Book Hubble 15 Years + Brochure 5 + EDU 2 ~ 1440 g	38	Päckchen	4.3	3.1	5.7	5	5.4	4.3	8.6	8.6	16	12.54	9	11	9	12.9	12.9	28.9	22.8	12	16.9	12.9
Book 1 + 1 postcard 770 g	26	Book	1.4	1.95	3.9	5	3.4	3	7	7	7.55	8.85	9	9	8	12.9	12.9	13.45	15.6	12	16.9	12.9
Book 1 + 10 postcards 860 g	33	Päckchen	4.3	2.84	4.95	5	6.3	3	8.6	8.6	11	10.89	9	10.6	8	12.9	12.9	14.34	19.8	12	14.9	12.9
DVD 1 + 3 postcards 183 g	13	Standard	1.44	1.99	1.95	4.5	3.44	1.44	4	4	4.55	4.29	9	6	4	8	8	9.55	7.8	12	10	7
10 Stickers 20 g	8	Standard	0.55	0.55	1.2	3	0.55	1.44	0.55	0.55	0.55	2.64	4	0.55	2	1.55	1.55	1.55	4.8	9	1.55	3
Poster	8	Roll	4.3	4.3	1.2	3	4.3	4.3	8.6	8.6	8.6	2.64	8	8.6	9	12.9	12.9	12.9	4.8	11	12.9	12.9

Key to the five schemes used in Table 2:

a. Fixed actual shipping charge per product (charged by Deutsche Post)

b. Percentage of sales price:
Shipping in Germany at 15 %, Europe 33 % and World at 60 % of the order

c. Fixed costs per price level of order:

Order amount	Germany	Europe	World
5 EUR	2,-	4,-	7,-
>5 EUR	3,-	6,-	9,-
>10 EUR	4.50	8,-	11,-
>20 EUR	5,-	9,-	12,-

d. Fixed actual shipping charge per first product (taken from Deutsche Post webpage), additional items charged with 2,- EUR

e. Fixed shipping charge per weight:

Weight	Germany	Europe	World
0 – 20 g	0.55	0.95	1.55
20 – 100 g	1.44	2.00	3.00
101 – 250 g	1.44	4.00	7.00
251 – 500 g	2.50	6.50	11.00
501 – 1000 g	3.00	8.00	12.90
1 – 4 kg	4.30	9.00	12.90
Above 4 kg	5.60	17.00	30.00