

Work-in-Progress Paper

Marketing of Science

- CERN and the Importance of Member States

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Abstract

This paper presents a case concerning a research organisation, CERN, and the arguments the organisation has presented over the years in order for the member states to continue financing the research. The case is rather extensive and stretches from the founding of CERN in the 1950s up until today. The ways in which CERN has presented itself over the years are then discussed in terms of marketing. The paper is based on a more comprehensive study that will result in a doctoral thesis. The theoretical backdrop for the paper can be summarised as an IMP approach.

Keywords: Marketing, Science, CERN, IMP approach

Introduction

Mankind has always strived to discover new things, but science, as defined in modern times, is a newer construct. It is generally stated, that modern science was constructed through the Scientific Revolution in the seventeenth century. Through this revolution, research gained an empirical foundation, and also managed to break away from the dogmas of the church (Brante, 1984:17). During the nineteenth century, the positive characteristics of science were even more confirmed, and by the turn of the last century, science was an important public institution (ibid. p.18). The attempt to answer scientific questions does come at a price, however. It has been claimed that “since the late nineteenth century, competing in fast-paced research fronts has become even more dependent on the ability to command resources” (Kohler, 1991:1). Nevertheless, the ability to control resources is not static, and it can be changed through the way we act. In very general terms, activities promoting perceived usefulness can therefore influence the ability to command resources. Thus marketing of science could increase the resources available to the researchers.

Science in general, and Big Science¹ - the topic of this paper – in particular, is resource consuming, and these resources are not always available. Furthermore, it has become increasingly difficult to receive sufficient funding (interviews with technicians and physicists at CERN). There can be different explanations to this, but, whatever the explanation, it will be argued that the shortage of funding has had effects on scientific organisations. One of the effects is increased demand for usefulness; policy makers all over seem to wish for scientific research to prove value to society. This also means that research organisations have to relate to the surrounding world in a new way.

In order for science to be produced, scientists alone do not suffice anymore, because “it is not just the people who work in the laboratories who do science, but everyone who takes part in sponsoring, producing, justifying, or making use of scientific knowledge” (Kohler, 1991:2). In other words, marketing of science is an integral part of making science.

The purpose of the paper is to analyse how CERN, the research laboratory studied, has related to its surrounding world since the early days of the organisation, or, in other terms, how it has been marketed. In particular, the paper will focus on CERN’s relation to its member states. In order to achieve the purpose, the paper will aim to answer the following questions:

- What aspects of CERN’s activities are highlighted in the interaction with the member states, i.e. how does CERN present itself?
- Have the aspects presented varied over time? If yes, how?
- In what way can the interaction be defined as marketing?

In order to answer these questions, a presentation of CERN’s development and interaction with the member states over time will be given in the main part of the paper.

The paper is based on a doctoral study of CERN and Swedish industry, including over a hundred interviews and extensive studies of secondary data (Åberg, forthcoming). In this paper, the focus is mainly on the secondary (historical) data, describing the development of CERN over time. The introduction is followed by a short presentation of CERN, after which a summary description of the marketing concept can be found. Thereafter the main part of the

¹ “Big Science” is a term used by both scientists and historians of science. It is used “to describe a series of changes in science which occurred in industrial nations during and after World War II.” The term usually refers to a number of specific characteristics, such as big budgets, big staff, big machines and big laboratories.

paper, called *Justifying CERN*, is laid out. This part attempts to describe CERN's development over time when it comes to presenting itself to the surrounding world. At the end of the paper, a short analysis of the endeavours of marketing science will be made.

A Short Presentation of CERN

CERN², the European Organization for Nuclear Research, is the world's leading laboratory for experimental particle physics. Its mission is to “*create new knowledge on subjects ranging from anti-hydrogen to neutrinos, to the proton's inner structure, to the generation of mass and dark matter*” (Lucio Maiani, former Director-General of CERN, CERN's website). This does not mean a lot to ordinary people, however. Put on a more basic level, this is where physicists from all over the world come to “explore what matter is made of and what forces hold it together” (CERN website, 2004-04-19). CERN's main purpose is to provide all these physicists with tools for their research. In particle physics, this means particle accelerators, which accelerate and crash particles either together or into fixed targets, and detectors, which function as magnifying glasses/cameras. A particle collision can be described as a car crash – and the detectors are there to take pictures of the scene after the accident has occurred. Based on these pictures, the physicists can then figure out what happened during the crash. There are two reasons for physicists to smash particles into each other: 1) to find out what is inside them, and 2) to use the energy freed in the collision to create new particles. Figuring out what happened during the crash thus helps scientists understand more about what matter is made of and what forces hold it together.

CERN was founded in 1954, as one of Europe's first joint ventures. From the beginning, 12 countries signed the CERN convention. At present, CERN has 20 member states³, but the laboratory is open for all countries with enough competence to participate in the experiments. Being a member state, however, entails special duties and privileges. Each member state makes a contribution to the capital and operating costs of the CERN programmes, and is also represented in the Council, which is responsible for all important decisions about the Organization and its activities. The financial contribution is made in proportion to each country's net national income.

The activities at CERN currently focus on the finalisation of the world's biggest accelerator project up to today's date, namely the LHC⁴ and the detectors built for it.

Marketing of CERN – Some Theoretical Aspects

In the introduction it was stated that there is an increasing demand on scientific research organisations, such as CERN, to create value for society. Society's demand, in turn, leads to

² The name CERN can be derived from the council, le *Conseil Européen pour la Recherche Nucléaire*, which founded the laboratory. This council does not exist anymore, so while the name remains, it can no longer be regarded as an acronym.

³ Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom.

⁴ For the interested reader, CERN's website provides an excellent “crash course” in high-energy physics and in anything related to CERN's accelerators and detectors: www.cern.ch

an increased need for justification of the organisation's activities, or, in other words, a need for marketing activities.

Traditional marketing (much like traditional economics) is based on a view of the firm as a distinct unit that, admittedly, buys and sells things, but does not interact with others in the production. This part of the firm's activities is more or less black-boxed, leaving the marketing dimension to be something that takes place once it is time to sell. Marketing of CERN obviously cannot take place in the way described just above, since the organisation does not have a distinct product to sell. Another definition of marketing thus has to be used. If we are looking for an alternative, what definitions of marketing can be found?

The seemingly endless amount of marketing literature provides us with a plethora of definitions of the marketing concept. Two of the most commonly used definitions, however, come from two very influential marketing associations. According to the *Chartered Institute of Marketing* "Marketing is the management process responsible for identifying, anticipating, and satisfying customer requirements profitably" (see e.g. Sargeant & West, 2001:2), while the *American Marketing Association* gives the following definition: "Marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational goals" (ibid.). Both definitions stem from a belief that marketing is about understanding and satisfying the customers' needs in a better way than the competitors are able to. Again, this is in line with a more "traditional" way of looking at marketing. In the case of CERN, marketing is not so much about understanding customers' or, rather, counterparts' needs. More to the point, it is rather CERN that in many cases can be seen as the customer, but marketing is still a crucial activity. How can CERN's marketing be described?

Just like neoclassical economics, traditional marketing theories cannot explain all empirical observations. As Håkansson and Waluszewski astutely put it: "With the elegant, strict and simple traditional economic assumptions behind it, marketing unfolds into a branch of economic theory appropriate for analytical issues and for producing practical managerial guidelines. The only severe problem seems to be /.../ the misfit between this elaborate research tool and the empirical area where it is supposed to be used." (2004:249) One of the solutions to this problem could be to take another approach to marketing. Just like we can look at business activities such as exchange in more than one way, e.g. as markets or as networks, we can also study marketing from a more interactive perspective. Instead of seeing marketing as only a process where the aim is to have a better understanding of our customers' needs than our competitors have, it could be seen as an interactive process, where value can be created by all parties, where counterparts are known, and where relationships develop over time (see e.g. Håkansson et al. 2004). Can a more interactive approach help in the understanding of CERN's way of justifying its existence throughout the years?

Going back to CERN's situation, there are a few things to sort out. Problem number one seems to be the question of customers. As mentioned above, in many ways CERN is more of a customer than a supplier. What CERN actually produces, i.e. physics research and, in the end, scientific results, has a very limited direct use, and thus the direct customers are mostly particle physicists. On the other hand, CERN is not an isolated unit functioning in a vacuum - quite the contrary. CERN is dependent on other actors to survive, and interaction with these actors therefore becomes crucial. It then follows that marketing of science is not anything of little consequence to the people involved; without funding, ultimately, there can be no research. Who, then, are these actors? The "recipients" of the marketing effort, or the

counterparts, can roughly be divided into three groups – all of them crucial for CERN’s long-term survival. These groups are the member states, or perhaps more correctly, the politicians of the member states; the firms in (primarily) the member states; and the students and researchers that guarantee the scientific outcome. This paper will focus mainly on the first of these groups, the member states. Why this choice has been made will (hopefully) become clear from the presentation of the main part of the paper below.

Justifying CERN

This part of the paper presents the emergence and development of CERN, with a special focus on different arguments that have been used in order to justify spending money on the organisation, i.e. to market it. The story is structured chronologically, and it has been divided into five different periods that each has its special characteristics.

PERIOD I

- The creation and construction of CERN (1949 – ca 1956)

The Beginning of CERN

Even though it is quite easy to find the exact date for when CERN officially came into being, the process leading up to it took several years. At the end of 1949, there were no less than two different proposals for European collaboration within nuclear physics. In addition, international organisations played pivotal parts in the discussions leading up to the creation of the convention. Deciding what countries could join seems to have been somewhat of a balancing act – on the one hand, the UK was allied with the USA, on the other hand, Switzerland did not want to risk its neutrality, and demanded that all European countries could (eventually) join. In May 1952, five countries had signed the initial agreement, and a first session was held (Hermann et al., 1987).

The Convention that gave its name to the organisation was signed in July 1953 and ratified by nine countries in September 1954, which meant that CERN came officially into being (Hermann et al., 1987:64). Some of the important decisions to be made during the interim period between the two dates mentioned above were choosing a site, agreeing on the clauses of the convention, and financing of both the interim and the permanent organisations.

In the discussion about where to locate CERN, there were four different contenders. According to Krige, the “unanimous decision” in favour of Geneva was “primarily the outcome of hard bargaining” (1987:239). Even after the scientists and politicians had agreed, however, the choice of location does not seem to have been made without protests. People in Geneva, afraid of compromising Swiss neutrality, held a referendum on the issue.

One of the main subjects of discussion seems to have been how to finance the organisation, and how much each country was to contribute. Already the interim organisation experienced delays and unforeseen increases in costs, and many of the member states to be were not entirely happy with the situation. In the end the problems were managed, and CERN was founded.

Before we continue on to the next period in CERN’s existence, it is important to point out that the member states, with both their politicians and their scientists, play a pivotal role in

the creation of CERN. Without the initiative from scientists, CERN would not have come into being: “It is difficult to describe the enthusiasm with which European physicists committed themselves to CERN as their common goal. It can probably be considered as the most successful piece of international cooperation to date.” (Nyberg & Zetterberg, 1977:7) It is important to remember, however, that CERN is very much a political construct, and it was the international character of the organisation, rather than the scientific advantages, that ultimately convinced the politicians to join.

PERIOD II

New accelerator = new organisation? (Early 1960s – 1971 (1976))

Discussions around CERN II

The construction of CERN’s laboratory and its first accelerators seems to have been carried out without any major disturbances. The first main accelerator at CERN, the PS, was hardly up and running before the physicists were planning for an even more powerful one, however. Indications were coming from both the USA and from the Soviet Union that exponentially more powerful accelerators were being planned and/or built, and as CERN’s physicists did not care for being left behind in this race, a committee was appointed to investigate the issue (Hadenius, 1972:9).

The construction of a new, much more powerful accelerator would of course have important financial implications. From the beginning, it was not a given that the new accelerator should be located outside Geneva. Suggestions came for as many as ten different locations in the different member states. Intense financial discussion followed in many of the member states, but when (the original) CERN provided a solution to place the new accelerator at the old site, and showed how this could also reduce costs, the discussion about location was over (Hermann et al. 1990). It took nearly ten years of discussions, however, from the 1963 suggestion, to finally reach a unanimous decision. By then, the design of the accelerator had been changed on several occasions as well.

So far, the discussions highlighted have dealt mainly with political and research issues. The focus will now change slightly, in order to study some technological aspects of the laboratory. From the beginning, CERN was more or less self-sufficient when it came to the technological side of physics research, i.e. to develop and construct accelerators and detectors. The organisation had enough money to do most things in-house, and, admittedly, the scale of everything was smaller. As the organisation grew, however, and more people were involved and more money spent, it became more important to in some way justify CERN’s existence. In the beginning of the 1970s, several studies were made at CERN that pointed at benefits apart from pure scientific ones. We will now take a closer look at some of these studies.

PERIOD III

- Industrial benefits and economic utility (early 1970s – mid-1980s)

Focus on Industry

CERN has always had a policy with respect to industry, but in the beginning this policy was quite simple: to try to find the best possible deal with industry for anything that industry could do. When CERN was started there was little high-tech industry in the technical fields

involved. Conventional products could be found, like steel and macro-magnets, but for instance instrumentation could not be found anywhere, so it had to be made in-house (Barbalat, interview). In the first 30 years of CERN's history, although CERN tried to get goods from industry, there was the necessity to develop things there, to build the prototypes and so on. This was of course helped by the CERN rules. Goods could be purchased anywhere, provided it was the cheapest product fulfilling the specification. According to Zilverschoon, there was a pronounced attempt to obtain the equipment needed for as low a cost as possible (1974). There were two rules to follow in order to achieve this: "the first is that we give to industry specifications that are as precise as possible for the equipment we need, in the hope that they can make better price calculations with a minimum of unknowns, and therefore a minimum risk for them. The other rule is that we see to it that for each tender there is sufficient competition." (Zilverschoon 1974:30)

There was an early awareness at CERN that the technology developed by CERN could be useful to industry. The first attempt to show this was an exhibition that was organised in 1974, the "Meeting on Technology Arising from High-Energy Physics". It was the first technical exhibition inside CERN, and all the firms known to CERN were invited to come and look at what was done (Barbalat, interview). According to the proceedings of this meeting, it was "primarily an accounting operation in which CERN displayed to its member states some of the techniques which have resulted from their investment in research on behaviour of elementary particles" (1974:v).

At the 1974 meeting there were also ideas aired about CERN's interaction with industry. Zilverschoon pointed out, that "this collaboration with industry is very important because, after all, industry actually builds 95% of our equipment. We only build about 5% ourselves within the Organization. Of course industry can live without us, but we could not live without them" (1974:32). But it wasn't just CERN's dependency on industry that was pointed out: "We have been created as an Organization to do research on high-energy physics. But we have slowly come to realize that the industry may gain something else from our efforts than just the immediate orders they get from us. Sometimes a firm has a contract with CERN from which they do not make any profit; but in the course of doing the job, it may be that they introduce a new product that they did not have before" (Zilverschoon 1974:32). In addition to developing new products, Zilverschoon pointed a number of other ways to gain benefits from working with CERN; a firm could, for instance, gain experience in doing tests, or have the advantage of using CERN as a test bed, or simply use CERN as a reference (ibid.). Ideas about transfer of knowledge from CERN were thus slowly introduced.

Even before the 1974 *Meeting on Technology Arising from High-Energy Physics*, however, a few member states had had industrial exhibitions and visits of firms at CERN. These visits were arranged by organisations within the member state in question, and the aim was twofold. Firstly, by presenting different firms from the member state at CERN, there was hope that people at CERN would see what was going on within the industry in that member state. Secondly, it was a way for the member state to get its firms interested in what was going on at CERN, in order for them to participate in tendering procedures etc. later on. Industrial exhibitions and visits are still a regularly occurring phenomenon at CERN today.

The "Economic Utility Studies"

After the first industrial exhibitions and visits at CERN, the second step was a study that was commissioned from H. Schmied. The study was presented in 1975, and it concerned CERN's economic utility to industry. Like Zilverschoon (1974) before him, Schmied starts out by

acknowledging the importance industry has for CERN: “The high-energy physics research programme of CERN makes unusual technical demands on the designers and constructors of equipment. Since a large part of this equipment is built by industry, it is clear that CERN receives a steady flow of technological information and help from this source” (1975:v). Schmied then makes it clear that CERN is to a large extent dependent on industry for its research equipment, and that it has to adhere to the technological standards of its suppliers. But, on the other hand, he asks the question of whether CERN does not influence industry performance. One of the major results of the study is, according to Schmied, the fact that CERN is also important for industry: “The present study has shown that these “pushed” technical demands have also had a surprisingly high beneficial impact on contracting firms, spreading out through many aspects of the firms’ activities, and that these effects can be quantitatively assessed by the firms themselves in terms of increased sales and saved cost figures” (1975:v).

In the Schmied study, economic utility is defined as the sum of increased sales and saved costs. The aim of the study was to look at how CERN affected the creation of added value in the firms that were awarded contracts. The value of the contract itself was not taken into account, but only value created afterwards. In addition, there had to be a clear link between the CERN contract and the subsequent financial benefits (ibid, pp.1-2). The interviews, which included a total of 260 firms, and all in all 345 cases, were chosen on the basis that they might have created utility (ibid, p.3). In other words, this means that the cases were not randomly selected, but picked based on the potential usefulness. The fact that this may influence the study is not commented on.

The results showed that the economic utility from the contracts, including indirect benefits, was about 3 times higher than the amount of the contract. This figure is referred to at a number of various places in texts about CERN, written by many different authors, and many years later (see e.g. *Proceedings from the first CERN Workshop on Basic Science and Technology Transfer*, 1997). The study has been vastly criticised as well, but it was the first of its kind in Europe, and it showed that in high-tech there was a multiplying factor (Barbalat, interview). In 1984, a similar study was made at CERN, and the results were pointing in the same direction (Bianchi-Streit et al.). The second study also included some of the firm studied in the first study, and it was found that the Schmied study “verified that CERN, with its purchases of high technology equipment, often causes positive changes in the turnover and the production techniques of its suppliers, and that managers are prepared to elaborate and communicate quantitative information related to these effects” (Bianchi-Streit et al, 1984:1).

Thus, during the 1970s and the beginning of 1980s, the concept of economic utility is introduced, and it is hinted that firms can benefit from interacting with CERN. It is not until the latter part of the 1980s, however, that these arguments become important in order to motivate the member states spending money on CERN. In the next section we will look closer at some of these arguments, and especially the change in argumentation.

PERIOD IV

- *Change in arguments for why CERN should be financed (mid-1980s – ca 1990)*

Why Finance CERN?

During the 1980s, there was a change. Until the early 1980s there were no serious problems of financing at CERN, and everything ran quite smoothly. But when we arrive in the early

80s, two things happen at the same time (Barbalat, interview). First of all, member states start watching their spending more carefully, and the budget thus becomes more difficult to obtain. Secondly, CERN is just embarking on the enormous LEP-project, so the scientific community needs all the support it can get. As the experiments grew in both size and cost, it therefore became more and more important to justify the expenditures to the member states. Justifications were first based on the importance of the research - for instance, the 1983 detection of W and Z vector bosons, that awarded CERN physicists the Nobel prize in 1984, was announced at a press conference less than two weeks after the results were first presented to the scientific community. Krige finds it amazing that CERN's management decides to make these findings public, to market them, before the results even make it to the scientific literature (1993:153). Because of several member states' reluctance to continue to finance CERN, it seemed apparent that other arguments besides the scientific ones were needed. The member states did not appear satisfied with funding "science for science's sake" anymore.

Attempts to create an interest for CERN among the general public can be seen in several activities. For instance, at the inauguration of LEP in 1989, CERN arranged a special press day, and both the King of Sweden and the President of France were there to give speeches (Krige, 1993:153). The Laboratory has since hosted a number of open days for the general public, as well as other events, and the celebration of its 50th anniversary (in 2004) also included a large number of activities for non-CERN people.

Perhaps the most important argument, however, in convincing the member states that CERN is worth funding (apart from the scientific reasons, of course), is that of its usefulness to industry. According to Barbalat,

"we started playing the argument that CERN is not only interesting scientifically, but it is good for the economy, it is good for industry, the industry benefits etc. So we did develop, if you like, this sort of communication policy about the return from CERN to industry. And this might have been a mistake, because it has somewhat backfired later on" (interview).

In 1985, a committee was set up at CERN to look for possibilities to intensify the cooperation with industry (Krige, 1993). It was felt that a lot of the technology developed at CERN could find other uses in the outside world. The committee was called the "Committee for Relations with Industry", chaired by Giorgio Brianti, and the aim was to carry out an in-depth study of the relations between CERN and industry (Abragam et al., 1987). The committee work led to the setting up of a number of technical boards, and later to the establishment of the "Industry and Technical Liaison Office" (Krige, 1993:154). In charge of setting up this office was Oscar Barbalat, who had been working at CERN for a very long time and in many positions.

Barbalat describes the setting up of the Industry and Technical Liaison Office as follows:

"In parallel, when I created this office for industry-technology relations, I wanted to develop the relations. There were of course some relations with industry through the purchasing office, but this was not systematic, so I tried to make something that was fair. I took Norway as a model, because Norway had an initiative already in the mid-80's to appoint a consulting engineer as a liaison between their industry and CERN. He was not a civil servant, but someone who was experienced within industry, and he still had his own consulting firm. And he was coming to CERN every six weeks – two

months, and was here for two or three days, establishing contacts with engineers, and of course with administration, to see what was happening here, and try to match it with Norwegian industry. And he was quite successful, so this became my model. I thought that if all the member states could do that, it would be a good thing.” (interview)

This is how the concept of the industry liaison officers, or the ILOs, was created. The system of ILOs was set up to improve the flow of information between CERN and the firms from all member states (CERN website). According to Barbalat, this system also backfired somewhat:

“It did not backfire for all countries, but it is not easy, in a given country, for the administrative body to find a man like this Norwegian. So the backfiring of the thing was that many countries found it easier to find a man within the civil service, so it is not a man who knows the industry, it is man who knows the administration. And that is completely different. And what was really backfiring with my plan, which I still feel sorry for, was that those people, having come out of the administration in the member states, or having close ties with the administration, they started to behave as delegates of the council, and therefore to meddle inside CERN, and interfere with the normal running of things – they were trying to influence the selection of firms from the inside. Not all of them did it, of course, but it is enough if a few do it” (Barbalat, interview).

In one article, Altaber and Barbalat (1993) also use the mid-80s as the turning point. Their reasoning, however, is slightly different. “In contrast to earlier times when CERN had no choice but to carry out itself most of the technological development for its research, the increased level of European industrial technology means that collaborative developments are possible. In addition, in the present economic environment, there is a great pressure to reduce CERN’s manpower. This is more and more forcing CERN to contract out a significant part of its development and production needs to industry.” (Altaber & Barbalat, 1993:1)

At about the same time, big firms became more interested in CERN, because they realised that CERN could be a rewarding customer. Maybe not so much for the money the firm could make, but for the high-tech image they could get. And then industry also started to criticise the way CERN was doing its business, specifically for the very detailed specifications. The specifications were actually for something that was already designed in the lab, and industry’s task was just to build it according to the blueprint. The big firms where not competitive in this area, because big firms have big overheads, so they complained about small- and medium-sized firms getting the orders. The big firms claimed that CERN was over-staffed with engineers. These complaints were picked up and forwarded by especially the German and the British delegations. (Barbalat, interviews) When people at CERN started to reflect on this, an internal committee was set up⁵, followed by an external review committee⁶. The result was that CERN was forced to review its policy with respect to

⁵ The CERN Committee for Relations with Industry, which started working in October 1985. It was chaired by Giorgio Brianti, and a preliminary report was published in March 1987.

⁶ The CERN Review Committee, consisting solely of people that, with one exception, did not have any connections to CERN, or to particle physics for that matter. The task of the Review Committee was:

- “to advise the Council how human and material resources, employment conditions, structure, operations and future use and development of facilities might be developed to operate with maximum cost effectiveness and value for money at alternative levels of funding by present Member States, and to assess their consequences for the CERN programmes and for services to Member States.
- to assess the possibilities for engaging and enlarging other sources of funds and resources

industry. The new policy would let industry do more things than in the past, and CERN was to try to find firms that were willing to design it all together with CERN staff. The firms then realised that they were to do it all on their own, and they had to create collaboration systems for it. This resulted in all sorts of cases where engineers from the firms were coming to CERN, working side by side on a prototype etc. In practice this meant a much greater technical collaboration between CERN and industry in the late 80's, with common development projects, joint-ventures and so on (Barbalat, interviews).

PERIOD V

- Higher demands on rules and organisation (early 1990s – today)

Change in the Purchasing Procedures

In the early 90's there was a new development because CERN was trying to convince the member states to approve of the LHC. This included the introduction of a new factor, which resulted in CERN staff becoming the victims of their own communications policy. The new concept was the industrial return, and the member states wanted to see this industrial return, so they started looking at statistics. And then they started asking for some sort of fair return. Other European research facilities had this policy, and the member states wanted a similar system for CERN. In 1993 the council decided that in order to get a more balanced return within the member states, a balanced return system was introduced. The old system was felt to favour the host states, Switzerland and France, too much.

So there was an evolution at CERN towards closer contacts with industry, and there was an increased transfer of technology with the joint development, but there was also the perversion of the idea of fair return. On the other hand it has its benefits. The benefit of this is the support from the member states. Barbalat claims that “if we had not introduced all of that, we would probably not have gotten the agreement for the LHC. Several delegates have told me this. And this would probably have meant the end of the organisation” (interview). In addition to the concept of fair return, the percentage of the budget spent on industrial contracts has also been used as an argument (see e.g. *Proceedings from the first CERN Workshop on Basic Science and Technology Transfer*, 1997:4).

Technology Transfer and Spin-off Effects

Even though the ideas of technology transfer and spin-off effects from CERN seem to emerge in the late 1980s (see e.g. Barbalat; 1990, 1993, 1994a, 1994b, 1997), they become more and more important towards the end of the 1990s. As a result of this process, a new division was introduced in January 2000, the ETT (Education and Technology Transfer) division.

According to the web site, CERN's member states have asked the organisation to introduce an active technology transfer policy. The specific aim of this policy is to “establish CERN's technological competence in European industrial and scientific environments, and to demonstrate clear benefits of the results obtained from the considerable resources made available to particle physics research” (CERN website, 2006-01-05). The aim of the new technology transfer group is to “make known and available to third parties under agreed conditions, technical developments achieved in fulfilling the laboratory's mission in

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- to report within one year findings and recommendations to the CERN Council and hence to the governments of the Member States” (Abragam, 1989:335).

fundamental research” (ibid). In addition to the focus on technology transfer and spin-off effects, CERN has adopted a new policy when it comes to intellectual property in general, and specifically to patents. CERN is now actively trying to find technologies that are suited to be protected with patent rights. More than one manager has wistfully mentioned CERN’s greatest spin-off ever, the WWW, and said “if we had only patented it”. It has been stated, however, that “it is doubtful that CERN, under the current lean funding model, will ever have the luxury of developing something of such significance again” (O’Rourke, 2007).

Having gone through the ways in which CERN has been presented to the surrounding world and its counterparts over the years, these justifications will now be summarised and discussed.

Summarising the Arguments

From the historical presentation of CERN’s development above, it is clear that there has been a change over time in the arguments used for justifying CERN; some of them scientific arguments, others political or industrial (business-) arguments. Although CERN can be seen as having a number of different counterparts, the overall aim is to keep the member states willing to continue financing the organisation, and this can also be seen in the arguments below.

Table 1: Characteristics of Different Periods at CERN

Period	“Problem(s)”	Justification	Additional action(s)
<i>Period I</i>	<ul style="list-style-type: none"> Political issues Financial issues 	<p>Joint European project (control over nuclear research)</p> <p>Justified with political arguments</p>	
<i>Period II</i>	<ul style="list-style-type: none"> New accelerator (financial issues, scientific issues) 	<p>Scientific advances</p> <p>Financial justification by building it at the original site</p> <p>European endeavour</p>	
<i>Period III</i>		<p>Benefits to industry from interacting with CERN</p> <p>Economic utility from high-tech contracts</p>	<p>“Meeting on Technology Arising from High-Energy Physics”</p> <p>“Economic Utility Studies”</p>
<i>Period IV</i>	<ul style="list-style-type: none"> Financial difficulties because: <ol style="list-style-type: none"> Economical constraints in Member States Bigger experiments 	<p>Scientific (Noble prize)</p> <p>Usefulness to industry</p>	<p>Industry and Technical Liaison Office (ITLO) is set up</p> <p>Industrial Liaison Officers (ILO) are introduced</p>
<i>Period V</i>	<ul style="list-style-type: none"> Financial issues 	<p>Industrial Returns</p> <p>The rise of the Technology Transfer argument</p>	<p>Introduction of “fair returns”</p> <p>Technology Transfer Office</p>

During *period I*, the scientists from the member states-to-be were heavily involved in the discussions, and it was interaction between scientists and politicians that eventually led to the founding of CERN. Their respective incentives differed: the scientists wanted to keep some level of nuclear research in Europe, while one of the main objectives of the politicians was to avoid another war. There were both political and financial issues with the upstart of CERN, but the main arguments used were almost solely political. The scientists were of course interested in the science, but they also used political arguments to get their ideas through. The initial funding of CERN, however, was limited to a certain period and infrastructure, so extending the involvement of the member states required additional arguments.

No later than the first accelerator was up and running, plans for a new accelerator were already being laid out. *Period II* describes the discussions around the so-called CERN II, and how the issue was resolved. The new accelerator was claimed to be needed in order to keep up with American research, but the problems for realising it were mainly financial. There was some political haggling going on about the localisation of the new accelerator, but when the idea of placing it together with the original accelerator were presented, thereby using investments already made, this was the option chosen. Sweden was one of the member states discussing to opt out of CERN II, but in the end it was decided that the country would continue to participate. It has been presented as a political decision: Sweden did not take part in the EC, but they would stay in the joint research project.

Period III describes the introduction of new justifications for CERN, in that industry was introduced as a piece in the puzzle. It was “proven” in a number of ways that industry could benefit from interacting with CERN; including the two studies of economic utility resulting from high-tech contracts with CERN. This is the period where the first tendencies towards justifying the research organisation by usefulness to industry emerge.

Technological and scientific advances lead to the possibility of building even larger accelerators. What is here referred to as *period IV* has been described as a period of change (Barbalat, interviews). The experiments, i.e. the accelerators and detectors, were getting bigger and bigger, thus requiring more and more resources. At the same time, CERN was experiencing what has been described as economical constraints from the Member States. In this case, justifications were first based on the importance of the research, for instance, some ground-breaking research was announced at a press conference less than two weeks after the results were first presented to the scientific community (this later led to the Nobel Prize). According to Krige “it is striking that the laboratory management’s desire to ‘market’ these findings was so great that they were reported in the mass media before they were published in scientific literature” (1993:153). In addition to marketing the organisation with scientific arguments, however, the “usefulness to industry” card was played. It is during this period that the Industry and Technology Liaison Office is set up, and that the system with Industry Liaison Officers is introduced.

Period V is really just an extension of period IV, in that it presents both the same problems and similar justifications. In addition to the already-existing system with ITLO and ILOs, new purchasing procedures are introduced, with the concept of fair return, and the technology transfer concept is put in focus. We will now move on to the end of this paper, where some final remarks about justifications for CERN and marketing of science will be given.

Marketing of Science – Final Remarks

In the introduction of this paper, a number of questions were asked. This final part of the paper will take us back to those questions, in order to see whether some answer can be given. As can be seen from the short summary above, a number of arguments for CERN's usefulness have been used over the years. During the early years, the scientific and political issues played an important role, and even if those are still present, there is an obvious tendency towards more and more financial justifications. According to Krige, "CERN is now making a concerted effort to be seen not simply as a scientific and political success, but also as a stimulus to advanced technological development in Europe" (1993:154). It seems fairly clear that the recurring problem, or issue, has to do with the financing of CERN. This also means, that interaction with the politicians in the member states is crucial, and that this interaction, in the end, has to do with CERN's survival. Krige gives voice to the same thoughts in the following statement: "No-one today doubts the excellence of the science and engineering done at CERN, which is universally recognized as an outstanding high-energy physics laboratory. What is being questioned by governments is not the content of the science, but its cost. In short and too simply, if there is one single factor behind CERN's drive to sell itself better in the member states, it is money" (1993:154).

It is interesting to note, that the industrial benefits from interacting with CERN were highlighted relatively early. From the beginning, it was only the industrial contracts that were mentioned, while concepts such as technology transfer and spin-off effects were first seen during the latter part of the 1980s. All the industrial- or business arguments are used to reinforce the argument that CERN is useful to society. Altaber and Barbalat claim that industrial benefits are proof of "the magnitude and the unsuspected wealth of the technology transfer occurring through the procurement contract mechanism" (1993:2). This statement, however, can also be seen as part of the marketing of CERN.

Even though the industrial arguments for CERN are used as a marketing tool, there are studies showing different kinds of industrial benefits from working with CERN (see e.g. Nordberg 1997, Åberg 2007). The benefits, however, seem to arise *when the firm in question is interacting on a more long-term basis* with CERN. Getting a CERN contract is not enough for a firm to benefit from working with CERN, and arguments such as industrial benefits, technology transfer, spin-off effects, and fair industrial returns are not sufficient to justify spending money on CERN. If arguments apart from the purely scientific arguments are needed, then further studies should be made to show *in what way* CERN can be useful to society in general and industry in particular.

References

- Abragam, Anatole, 1989, *Time Reversal: An Autobiography*, Oxford: Clarendon Press.
- Abragam, A. et al., 1987, *Final Report of the CERN Review Committee*, CERN/1675, 87/115/5/e. Geneva: CERN.
- Altaber, J. & Barbalat, O., 1993, "CERN's Experience in Involving Industry in the Development of New Large Scientific Facilities and the Induced Technology Transfer", paper presented in Oxford, 1993.
- Barbalat, Oscar, 1990, *Applications of Particle Accelerators*, BLIT/90-04, Geneva: CERN.
- Barbalat, Oscar, 1993, *Technological Spin-off from Accelerators*, BLIT/93-68, Geneva: CERN.
- Barbalat, Oscar, 1994a, *Opportunities for Industry with CERN*, BLIT/94-4, Geneva: CERN.
- Barbalat, Oscar, 1994b, *Spin-off from Particle Physics – Technology Exchange with Industry, Examples from CERN*, BLIT/94-117, Geneva: CERN.
- Barbalat, Oscar, 1997, *Technology transfer from Particle Physics – The CERN experience 1974-1997*, BLIT/97-1, Geneva: CERN.
- Brante, Thomas, 1984, *Vetenskapens sociala grunder: en studie av konflikter I forskarvärlden*, Stockholm: Rabén & Sjögren.
- Bianchi-Streit, M. et al, 1984, *Economic Utility Resulting from CERN Contracts (Second Study)*, CERN yellow report 84-14, Geneva: CERN.
- Hadenius, A., 1972, *Sweden and CERN II – The Swedish Research Policy Debate*, The Committee on Research Economics (FEK), Stockholm, Report 3, Lund: NFR, Editorial Service.
- Hermann, A. et al, 1987, *History of CERN vol. I*. Amsterdam: North-Holland.
- Hermann, A. et al, 1990, *History of CERN vol. II*. Amsterdam: North-Holland.
- Håkansson, H., Harrison, D. & Waluszewski, A., (2004), *Rethinking Marketing: Developing a New Understanding of Markets*, Chichester: John Wiley & Sons Ltd.
- Håkansson, H. & Waluszewski, A., 2004, "Conclusions: Reinterpreting the four Ps", in Håkansson, H., Harrison, D. & Waluszewski, A., *Rethinking Marketing: Developing a New Understanding of Markets*. Chichester: John Wiley & Sons Ltd. pp 249-262.
- Kleppestø, T., 1996, *Industry Liaison Models between International Laboratories and Norwegian Industry and R&D. Case study: CERN*, SNF-report number 52/96, Norwegian School of Economics and Business Administration, Department of Economics, University of Oslo.
- Kohler, R.E., 1991, *Partners in Science*. Chicago: The University of Chicago Press.
- Krige, J., 1987, "Case Studies of Some Important Decisions", in Hermann, A. et al, 1987, *History of CERN vol. I*. Amsterdam: North-Holland, pp. 237-292.
- Nordberg, Markus, 1997, *Transaction Costs and Core Competence Implications of Buyer-Supplier Linkages; the Case of CERN*, Doctoral Dissertation, Tilburg University, Department of Business Studies. Geneva, Switzerland.
- Krige, J., 1993, "The Public Image of CERN", in Durant, J. and Gregory, J. (eds.), 1993, *Science and Culture in Europe*. London: Science Museum, pp. 153-157.
- Nyberg, S. & Zetterberg, K., 1977, *Sweden and CERN I – the decision-making process, 1949-1964*, The Committee on Research Economics (FEK), Stockholm, Report 9, London, UK: NFR, Editorial Service.

Peter, M., 1974, "Closing Remarks", *Meeting on Technology arising from High-Energy Physics*, 1974, CERN yellow report 74-9, p. 167, Geneva: CERN.

Proceedings from the first CERN Workshop on Basic Science and Technology Transfer, 1997, *Basic Science and Technology Transfer: Means and Methods in the CERN Environment*, Workshop Records, Geneva 28-29 November 1997. Geneva: CERN.

Sargeant, Adrian & West, Douglas C., 2001, *Direct and Interactive Marketing*. Oxford: Oxford University Press.

Schmied, H., 1975, *A Study of Economic Utility Resulting from CERN Contracts*, CERN yellow report 75-5, Geneva: CERN.

Shinn, Terry, 2002, "The Triple Helix and New Production of Knowledge: Prepackaged Thinking on Science and Technology", *Social Studies of Science*, Vol. 32, No. 4 (Aug., 2002), pp. 599-614.

Zilverschoon, C. J., 1974, "Some Aspects of the Realization of High-Energy Projects in CERN", *Meeting on Technology arising from High-Energy Physics*, CERN yellow report 74-9, pp. 27-33, Geneva: CERN.

Åberg, S., forthcoming 2007, *Science in Interaction* (working title), Doctoral Thesis, Department of Business Studies, Uppsala University.

Interviews

Barbalat, Oscar, former ITLO, CERN; 1999-03-10 & 1999-03-15

O'Rourke, Brendan, former CERN employee, discussions, spring 2007

Interviews with technicians and physicists at CERN

Internet References

CERN's website: <http://public.web.cern.ch/Public/Welcome.html>