

Space Marketing: A New Programme in Technical Education*

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Introduction: space markets

It is not easy to extrapolate market shares and turnovers in the rapidly developing space environment and certainly most predictions tend to be slightly optimistic. However, experts estimate that space activities will soon account for 70 to 100 billion US\$ in annual turnover, and this relates only to the space segment; the associated ground segment is estimated to generate a similar turnover.

The challenge for European industry now is to maintain its market share with Ariane and to compete effectively in the global telecommunications and remote-sensing markets that have been initiated in the last decade.

Thirty years ago, space was in its infancy. The European space industry was almost non-existent and most international space programmes were driven by captive markets, not least Government orders associated with military programmes. With the development of commercial telecommunications satellites and new launchers, new services created new customers and the commercialisation of space was initiated. Today, this process has led to the development of new markets, each of which is at a different stage of maturity. Applications in the fields of navigation, direct-broadcast television and mobile telephony are just three examples of services for which the space industry has definitively taken the lead, investing its own resources and competing for market share on a world-wide basis.

* Most of the concepts presented in this article have been extracted from courses given by the authors to young engineers and business students attending the European School of Management in Paris, the International Space University (ISU) in Strasbourg, and the Technical University of Delft, in The Netherlands

Although Table 1 relates to two of European space industry's best successes, it does illustrate that after a delayed start we are now catching up in the World's space markets. If this trend is maintained, an annual turnover in range of 20 to 30 billion US\$ can be achieved within the next decade. Clearly, in such a rapid-growth environment, the 'marketing' of space industry will be vital.

Marketing in space agencies?

Let us first examine the applicability of marketing in the context of non-profit organisations, and then see how the concept might be applicable to ESA:

Marketing in the non-profit sector

At first glance, one may have the impression that marketing techniques are less applicable for the non-profit sector. This was indeed the case until the end of the 1970s, but since then a number of elements have changed the macro-economic environment:

- Public funding has decreased and major cutbacks have been introduced, partly due to the fact that social priorities are being more vigorously pursued.
- Many non-profit organisations were founded upon income from donations, but the philanthropic nature of our society is decreasing.
- The economic structure has changed, with private companies 'attacking' the traditional non-profit sectors such as health care, public transportation, postal services, etc.
- Due to problems with government spending profiles, a number of protected markets have been 'liberated' and services privatised in order to reduce debts (telecommunications, airlines, motorways, etc.).

In such an environment, the non-profit sector is confronted with the same powerful competition as any commercial organisation. These competitors include the large space conglomerates offering end-to-end products. Of the 20 leading companies in the USA aerospace sector in 1980, only 10 were left in 1995 after the many mergers. A new wave of mergers in the last two years has reduced this figure to 3. European space industry is currently experiencing similar mergers and of the 5 largest European companies soon probably only 2 will remain.

Most non-profit organisations are reacting too late to such growing competition due to their internal resistance to change. They develop what is called a 'marketing myopia', as described by Ted Levitt from Harvard Business School in 1960, whereby they do not always

'Marketing is a pervasive societal activity that goes considerably beyond the selling of toothpaste, soap and steel. Political contests remind us that candidates are marketed as well as soap; student recruitment in colleges reminds us that higher education is marketed; and fund-raising reminds us that causes are marketed... Yet no attempt is made to examine whether the principles of 'good' marketing in traditional product areas are transferable to the marketing of services, persons and ideas.'

Philip Kotler, 1975

realise that such competition exists. This is not the case for industry, where falling profits and erosion of market share are early indicators of impending difficulties.

One example is provided by the commercial blood banks in the USA, which suddenly overtook the Red Cross in numbers of voluntary donors simply because the latter counted on 'fair-play' and the public's philanthropic attitude. Only a specially tailored marketing campaign emphasising such values partially recovered the situation.

Every organisation, whether profit- or non-profit-based, has to 'sell' a service to its 'customers'. Non-profit organisations are often asking for a sacrifice on the part of their customers (frequently in the form of donations) and have to convince them that, in return, they will give them 'value for money' in terms of economic, social or psychological benefits. This process is the real basis of marketing in the non-profit environment.

Marketing in the framework of ESA

ESA's own objectives

Non-profit organisations are an essential ingredient for society's long-term survival. In a competitive market, industrial companies can only devote a small percentage of their funds to basic research; higher percentages would influence their overheads and hence their prices, and ultimately their mid-term survival. Moreover, industry concentrates mainly on applied research, to stimulate the development of new products and thereby enhance its competitiveness.

Where long-term objectives are pursued, which is essential for mankind's long-term prosperity, the development costs can only be borne by governmental or delegated bodies funded from taxes. When the funds involved are too high, cooperation at supranational level is often required, e.g. via CERN, the World Bank or UNESCO. Because objective performance measurement is more difficult in such organisations due to the lack of profitability indicators, there is obvious room for easy

criticism and objective doubts. Therefore, the organising parties founding such organisations build-in a number of rules and mechanisms to maintain a certain degree of control over the effective use of resources. In ESA's case, such rules are contained in its Convention. Among its goals, ESA should contribute to the development of a European space industrial capacity, as well as supporting European space industry's competitiveness. On the other hand, ESA's procurement policy is also based upon these rules and is aimed at optimising these boundary conditions, which are not the same as those in a 'free-bidding' competitive environment.

It is important to recognise some basic marketing boundary conditions that stem from this:

- There can, a priori, be no competition between ESA and European space industry.
- Products to be highlighted are those with long-term potential interest for European industry (spin-off principle).
- Efficiency in pursuing these goals cannot only be based upon cost measurement. Emphasis has to be put on demonstrating efficient use of resources and the return — in tangible terms — to European space policy.
- Promotion of the development of European space capacity is the main objective.

One cannot stress sufficiently the difference between a budget-driven organisation and a profit-making, cost-driven, organisation. A non-profit organisation has a given budget and its aim is to ensure a maximum return in terms of its customer values within that budget.

Table 1. Evolution in European market share

Segment	Market Share		
	1970-1979	1980-1989	1990-1999
Communication satellites	0 %	25.2 %	28.1 %
Launch systems	0 %	31.8 %	41.5 %

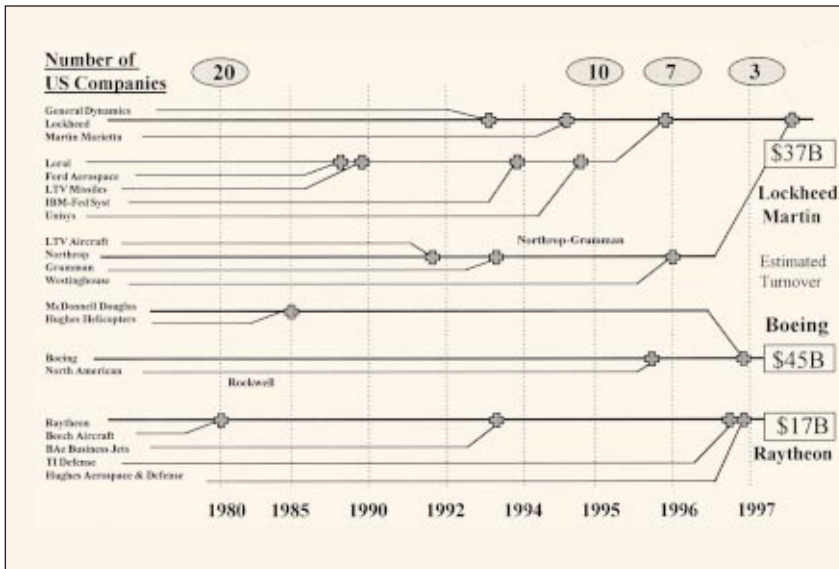


Figure 1. Space industry fusions and mergers in the USA

What are ESA's products and who are its customers?

ESA's customers at the end of the day are the taxpayers in the various Member States. Their expectations of the value of space are translated, via the science policy in each Member State, in a democratic process. As this process is relatively long and because some budgets are relatively fixed over longer periods, the risk is that changing expectations cannot be satisfied in the medium term.

In the USA, for example, the so-called Augustine-Committee concluded in December 1990 that the goals being set by NASA were not reflecting the expectations of the general public. In August 1991, a US House Subcommittee opened an investigation into NASA's management practices 'to learn why the Agency that for so long epitomised excellence has lost the claim to that honour'. The report was called 'NASA's Mid-life Crisis' and accelerated important changes.

The Sojourner, a relatively low-cost mission, which landed on Mars on Independence Day in 1997 and captured the nation's attention for several weeks with its pictures accessible via

the World Wide Web (WWW), was a clear illustration of this changed, more marketing-oriented approach.

In ESA's case also, the general public wants to see definite European products:

- direct products, e.g. meteorological or Earth Observation data
- indirect products, e.g. spin-off
- non-tangible products, e.g. Space Station.

The direct product derived from the space programme itself consists of the successful launch and its associated services, data from the satellites, operational services, specific generic technology, etc. These products are tangible and form the basis of ESA's promotion and publication policy.

The indirect products are not only the spin-offs in the form of tangible products, technologies or techniques derived from space programmes and applied in non-space industrial sectors, but also include the intangible know-how and ESA's internal competence. These products are promoted with difficulty even if they touch the general public in their daily lives, e.g. surgery, automobile technology, energy and environment, etc.

Finally, the non-tangible products are those which can be derived from long-term space programmes. Although these have a clear set of scientific and technical objectives, there is room for the unknown, the unforeseeable. Political commitment to this type of product is hard to achieve.

The conclusion of the 'Council of Wise Men of Salamanca' about the proposal of Christopher Columbus, now more than 500 years ago, should perhaps be recalled here:

'There can be no justification for your Majesty's support for a project based on extremely weak foundations and plainly, to anyone who knows about such things, impossible to achieve.'

Figure 2a. The 4P's of P. Kotler's Marketing Mix

Figure 2b. Factors and components of a marketing strategy



Key questions if ESA is to play a more active role in the marketing of its direct products:

Product

- Can we define more precisely what the product line is? Example: ERS-1 and 2 series, followed by Metop and Envisat. How do we differentiate the different systems?

Price

- Can we estimate the benefits of the space programmes versus their costs? Studies performed by the University of Strasbourg have estimated that, for every ECU invested in the Ariane-4 programme, the direct revenue generated in industry is 4 ECU. Similar studies have been performed for the ECS and Meteosat programmes.

Promotion

- Can we advertise our products and services? Together with our partners?
- How can we measure the effects of a direct promotion campaign?

Physical Distribution

- What is ESA's role and position in Earth Observation operations and data dissemination vis-a-vis other organisations, such as added-value companies, user organisations, etc.?

But even more recently, in 1902, we find such statements as:

'Flight by machines heavier-than-air is impractical and insignificant, if not utterly impossible' (Newcomb)

What about the other P's of the Marketing Mix ?

With our students we have tried to identify a possible application to space programmes of the '4P's' of the classical Marketing Mix elaborated by Philip Kotler (see Figs. 2a, b).

ESA traditionally promotes its programmes as they are approved and on a case-by-case basis. In the Marketing Mix, 'Products' often refers to a 'Product Line', covering a whole range of satellite services or launcher family. In the case of Earth Observation, we would have to promote the series from ERS-1 through ERS-2 and subsequent missions such as

Metop and Envisat as a family of products. A similar approach is followed with the Ariane launcher family, which offers a versatile launch vehicle easily adaptable to the customer's needs.

The notion of Product then leads to the definition of a 'Price', which of course will vary with the type of product and its conceived value. The price of products even from non-profit organisations such as ESA has to be seen as a cost, being the result from the taxpayer's standpoint of a political trade-off in terms of public investment against other options/activities. In general terms, the feeling of the average taxpayer is that space costs 'a lot'. It is a considerable shortcoming of the space era that such costs are not put in comparative, and therefore more realistic, terms sufficiently often. The development costs for a popular car can be 5 billion ECU, and those for a jet fighter, including a limited

Key questions raised in the case study on how to increase the ESA marketing action for technology transfer:

Product

- Besides ESA patents, how can we identify the ESA's internal and marketable know-how?

Price

- Can ESA's expertise be charged to an external customer? How can this consulting service be set up without disturbing ESA's core business?

Promotion

- Can we appear in the advertisements produced by companies which acquired ESA's technology? If so, how?



Case studies

Marketing ESA's direct products

ESA's direct products such as the remote-sensing data and telecommunications-satellite services, the Ariane launcher and the ground operations systems, are easy to analyse from a marketing standpoint since they represent the Agency's 'core products'. The marketing and commercialisation of these products and services has been transferred, with a few exceptions like Earthnet, to public institutions or private companies such as Arianespace, Eurimage, Eutelsat, Eumetsat, etc. These organisations are in charge of the marketing of the remote-sensing data products, the launch services, the telecommunication operations, etc. ESA's part in the marketing activity is limited to the promotion of the approved programmes and their results, with the main objective of fostering the decision-making process and the approval of new programmes for the future. Having no resources for advertisements or publicity, ESA's effort to promote its programmes to the general public is presently limited to just a few events such as Le Bourget Air & Space Show, the Farnborough Air Show, ILA in Berlin, etc. As far as educational activities are concerned, ESA's effort is limited to supporting national initiatives with the aim of adding a 'European dimension' to such events.

number of prototypes, of the order of 8 billion ECU. Even the organisation of the Olympic Games is costing about 2 billion ECU.

This brings us logically to the promotion of ESA activities, which has traditionally been targeted at the decision-makers and the specialised scientific and technical press. More recently, however, in response to the need to increase general awareness of ESA's programmes, pilot events have been organised with a new focus on youngsters and the general public. The special parabolic-flight campaigns for students, for example, have received substantial coverage in the general press. Demonstrations and animations tailored specifically for the general public have also shown that, even in the very particular forum of the Le Bourget Air & Space Show, a considerable amount promotion can be achieved if the appropriate messages and presentation style are used.

Marketing technology and technology transfer

The marketing of space technology, and technology transfer from space to non-space industrial sectors, has been delegated to Spacelink Europe, a network of brokers working under contract to the ESA Office of Space Commercialisation. This Technology Transfer Programme is a good example of the more active role that the Agency can play in marketing its technology and knowhow.

In today's rapidly growing information society, Place or Physical Distribution of results is an important topic. Modern communications tools allow the results to be conveyed directly to the customer, and we no longer need to bring the customer to the results. For example, NASA, anticipating that the Sojourner rover's exploits on Mars would be of considerable interest to the general public, installed 25 Web servers. Even they, however, had not counted on a peak of 35 million 'hits' per day, which completely overloaded the system. Systems like Teledesic can be expected to accelerate such developments exponentially. It is therefore of paramount importance to stay in tune with developments in the latest means of communication and use them appropriately.

Initially, the marketing technique used was a 'push' approach, with promotion through a catalogue of space technologies that have real potential for application in a non-space sector. These TEST Catalogues were largely distributed to European industry. Although they served as a showcase for the best transferable space technologies, experience showed that as a marketing tool it was not sufficient. Specific parts of the catalogues were therefore selected and direct-mailed to target industrial groups. From the 2 to 3% response to the TEST catalogues, the response rate grew to more than 10% with the direct mailing. The new method was complemented by a marketing 'pull', consisting of contacting industrial companies in various target sectors to identify their technology needs. The resulting matching

of the 'market's needs' with the 'space technology on offer' has led to several successful technology transfers.

Another marketing technique that appears well-suited for technology transfer or exchange relies on the concept of 'interactive marketing'^{*}, which involves anticipating the need for new technologies in two or more industrial sectors. In ESA's case, the idea is to search for non-space applications of a space technology before starting development of this technology. This method has been introduced into the ESA Technology Research Programme (TRP) by adding a 'commercial evaluation clause' in the contracts, requiring the contractor to study the commercial potential of the proposed technology for non-space applications. The first test cases showed that the early identification of potential partners or customers in sectors such as the offshore, chemical, pharmaceutical and biomedical industries, would not only offer a possibility to share part of the development costs of the technology, but would also avoid the heavy adaptation costs that, in the past, have blocked the commercialisation of several space technologies.

The closer interaction between the space industry and the non-space industrial sector has facilitated the transfer of knowhow and has thereby contributed to the success of the Technology Transfer Programme. In less than seven years, the Programme has resulted in more than 70 successful deals, accounting for more than 4 MECU in revenue for the space donors and a turnover of more than 30 MECU for the recipient companies.

Marketing the International Space Station

In terms of a Product, the Space Station has a number of unique benefits in the technical field:

- continuity of experimentation thanks to the long design lifetime
- availability of larger resources than previous stations (power, data capacity)
- quick access for samples, specimens etc. to and from space
- permanent presence of crew who can take care of unexpected events.

The difficulty with the Space Station is that the characteristics of the Product are of different natures: scientific, technical, socio-economic and geopolitical.

Although the subject of lengthy negotiation, the scientific use of the Space Station is being intensively prepared by the International Partners, with a strong focus on the life- and



materials sciences in order to derive maximum benefit from the astronauts' presence in the laboratories. However, use of the Space Station for technology development has been attracting substantial interest from industry, particularly since the last Call for Ideas and Proposals issued in 1997. Nevertheless, the strongest motivation for the Space Station is probably non-tangible. The international dimension of the project has no past equivalent. It will be a unique multi-cultural endeavour, a typical viewpoint being :

'It is fair to say that the International Space Station Programme is a test bed for future international space cooperation (...). The International Space Station collaboration is widely viewed by the nations participating as a test of our ability to sustain commitment over the long-term to a complex science and technology project.'

The price that we have to pay for this is certainly still the biggest problem when trying to 'sell' the Space Station in absolute terms. More

^{*} Interactive Marketing, by Jean-Marc Lehu, Les Editions Organisations, 1996

Examples of questions raised about the marketing of the Space Station:

Product

- Can we market the Space Station emphasising the non-tangible product, namely the 'space frontier' dimension? Should we emphasise the Space Station as a self-standing product or as a stepping-stone for interplanetary space exploration ?

Price

- Could we approach the general public with dedicated relative cost indicators (market survey)?

Promotion

- Should we allow commercial sponsorship on the Space Station ?
- What about creating a cartoon character to represent the COF? Such a character could be used to promote the Space Station to youngsters in the various countries?

Physical Distribution

- How do we establish the link with the non-space industry to encourage them to propose experiments to be conducted on-board the Space Station? The RADIUS (Research Association for Industrial Use of Space) was based on access to the industrialists by scientists involved in microgravity experimentation, who already have their networking and contractual relations with the various potential customers in the various industrial sectors such as the petrochemical, environmental and pharmaceutical industries. This approach led to the successful involvement of several private companies in the ground-based research, and some have even participated in the in-flight space experiments. In May 1998, for example, experiments prepared with a consortium of oil companies will be carried aboard the Space Shuttle.

than ever, it has to be stressed that the costs are spread over a large number of nations, bringing the cost per capita down to very acceptable orders of magnitude, namely annual costs of 10 ECU per person over the more than ten-year lifetime of the Station.

Scientifically, a different approach could be to compare the price of time in microgravity per kilogram. Such an assessment shows that the price will be in the order of 2 US\$ per kg.h for the Space Station, compared with 17 US\$ for the Space Shuttle.

As far as Physical Distribution is concerned, there are a number of techniques that can bring the general public closer to Space Station activities. The development of Computer Based Training Courses* which, besides being a training tool, can also be brought to the general public's attention via the World Wide Web (WWW), and the development of virtual-reality models distributed on CD-ROM are examples of means that can help bridge the gap between the space world and the general public.

Conclusion

For non-profit organisations, as for commercial companies, 'marketing' involves a mixture of elements, analogous to the ingredients for a cooking recipe. The marketing 'strategy' forms

the key for the preparation of a set of actions directed towards a clearly defined customer or target group. The various target groups as far as ESA is concerned are: the taxpayers (general public) as ESA's main 'end customer', the youngsters as ESA's future 'end-customers', the politicians, ESA delegate bodies, space industry, international partner organisations, operators of space systems, users of data supplied by space systems, etc.

By analogy with finance principles, ESA's 'net present value' could be compared to its accumulated successes, its present assets in terms of people and programmes, and its potential in maintaining European space industry in the forefront of the space-faring nations. The main difficulty is that the various target groups mentioned above have different perceptions of this value.

The advantage of elaborating a marketing strategy, even in a non-profit-making organisation such as ESA, is to increase confidence in the organisation's own capacity, identifying the key products — i.e. the 'technology champions' — and promoting these in the right format to the right target group. It also serves notice that the Agency is responding to its changing environment and actively focussing on new ways of doing business.

*<http://www.estec.esa.int/spaceflight/astronaut/eaccbt/cbt.htm>