

PRESENT STATUS AND FUTURE OUTLOOK OF THE ACCELERATOR INDUSTRY IN EUROPE

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Abstract

After LHC completion, maintenance and operation of this large and complex facility appeared to be a good opportunity for accelerator industry in Europe. On the other hand, construction of new big facilities like XFEL, FAIR, ESRF upgrade, FERMI@ELETTRA and MAX IV is now well under way. Design and construction of these facilities provide different type of opportunity for industry involvement. This contribution attempts to address the question, how big are these opportunities and other issues that are of interest to the accelerator industry in Europe like market size, policy issues and effect of current economic crisis.

ABOUT THE METHOD

The information used in this paper was gathered from different sources. The estimations of the market size are publicly available from ERID Watch [1] and ESFRI [2] programmes. Contributions from conferences and workshops were also used.

A questionnaire was composed and was sent to some laboratories and companies involved in the accelerator market. The purpose was to estimate the impact of the economic crisis and to investigate the possibilities for industry involvement in this field. Personal communication is also an important source of information on the role of industry in the development of accelerator infrastructure.

The present contribution includes some statistical figures. These should be interpreted within the context of this presentation. However, the statistical data may provide some quantitative indicators to the qualitative issues discussed.

MARKET SIZE

The estimation of the European accelerator market size was done based on the data from ERID Watch and ESFRI programmes.

ERID Watch

ERID Watch is a Coordination Action that aims to mutually improve the policy mix of the Member-States in order to increase the public investment efficiency for European Research Infrastructures (RIs) and develop Public/Private Partnership (PPP) in this context. It is funded under the 6th Framework Programme.

Member States, Research Institutes, universities, RI operators and industrial companies engaged in this proposal intend to exchange their experience and policies, in order to build-up recommendations and best-practices methods.

In the survey done by ERID Watch 51 existing Research Infrastructures and 8 ESFRI projects, covering all scientific domains, 30 institutional bodies, including regional and national authorities, also in new Member States and 175 companies, mostly Research Infrastructures' suppliers or/and R&D collaborators were interviewed.

Over 300 facilities have been identified as "medium-sized and large research infrastructures", i.e. those with construction costs exceeding 20 million € and a pan-European group of users. Examples of research infrastructures include research vessels, large laboratories, facilities such as CERN, research stations, synchrotrons, botanical gardens, telescopes, and large libraries of research data, e.g. for social science studies of populations.

Taking inflation into account, the annual budget for existing research infrastructures (excluding ESA) has shown an average increase of 5.5 percent per annum over the past 10 years. In addition, the ambitious development plans, as presented primarily in the ESFRI Roadmap, add substantial budgets for construction and operation of several new research infrastructures. Opportunities for industry to be suppliers to planned ESFRI facilities and to new national research infrastructures are expected to expand this market substantially in the medium term.

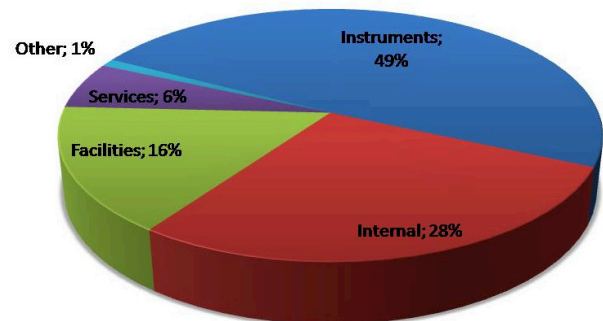


Figure 1: The distribution of the budget of the research infrastructures.

The total annual budgets of European research infrastructures are in the region of 8 to 9 billion €. The distribution of the budget of the RIs is shown in Fig.1. Almost half of the budget is used for instruments, including instrumentation, experimental infrastructure and associated technical services. The internal RI funding that is spent on staff and other elements not available to industry represents 28% of the budget. Facilities like buildings, general utilities and other infrastructure not directly connected to the experiment represent another 16%. A smaller part of the budget is used for initial and

ongoing services not directly connected to the experiments.

ESFRI

ESFRI, the European Strategy Forum on Research Infrastructures, is a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach. The mission of ESFRI is to support a coherent and strategy-led approach to policy-making on research infrastructures in Europe, and to facilitate multilateral initiatives leading to the better use and development of research infrastructures, at EU and international level.

The ESFRI roadmap is an ongoing process. It identifies new Research Infrastructure of pan-European interest corresponding to the long term needs of the European research communities, covering all scientific areas, regardless of possible location. First published in 2006, with 35 projects, it was updated in 2008 bringing the number of RIs of pan-European relevance to 44.

The findings of the ESFRI Roadmap 2008 are shown in Table 1.

Table 1: Anticipated Costs of the Planned RI Projects

44 ESFRI projects to be built till 2020	
Construction costs	Operations costs per year
18 billion €	2.2 billion €
10 “accelerator like” facilities	
Construction costs	Operations costs per year
8 billion €	750 million €
45%	34%

INDUSTRIAL EXHIBITORS AT PARTICLE ACCELERATOR CONFERENCES

The number of industrial exhibitors at particle accelerator (PA) conferences is an indicator of the state of the industry. Fig. 2 shows the percentage of the industrial exhibitors from different continents at five PA conferences. The major part (47%) of the industrial exhibitors came from North America, little less (43%) from Europe, while the share of the Asian exhibitors is quite low, only 10%.

However, the location of the conference has an important role that must not be overlooked. Fig. 3 shows the portions of the industrial exhibitors from different continents at each PA conference. It can be seen that at the European particle accelerator conferences (EPAC) the major part of the industrial exhibitors was from Europe and a smaller part from North America. At the PAC conferences, which were held in North America, the picture is just the opposite: major part of the industrial exhibitors from North America and smaller from Europe.

The share of Asian industrial exhibitors, however, is very small in both cases.

IPAC 2010 + PAC 2009 + EPAC 2008 + PAC 2007 + EPAC 2006

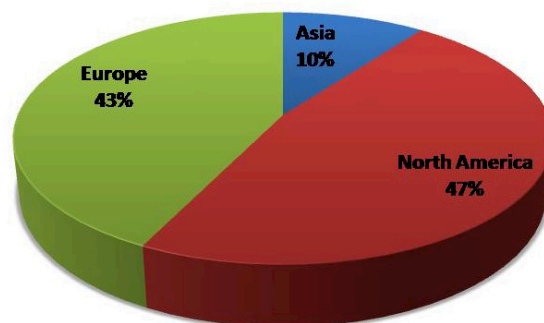


Figure 2: The share of industrial exhibitors from different continents at PA conferences.

In 2010 the first International particle accelerator conference took place in Japan. The industrial exhibitors from Europe, North America and Asia were equally represented at this conference as can be seen in Fig. 3. This equal distribution justifies the organisation of the international PA conferences.

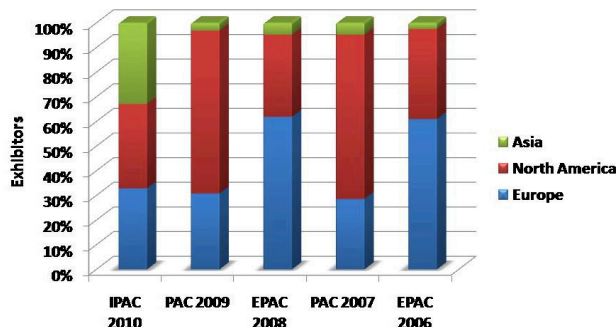


Figure 3: The share of industrial exhibitors from different continents at each PA conference.

TWO EUROPEAN ACCELERATOR INDUSTRY CASES

The European accelerator industry with its products answers to a wide range of needs of the accelerator market. In this paper, however, two specific fields that the accelerator industry covers will be presented.

Hadrontherapy

There are three companies that originated in Europe providing products for medical treatment of cancer by hadrontherapy. These companies are IBA, Belgium; Siemens, Germany and Varian, USA.

By 1st November 2008 Danfysik’s Particle Therapy Division was sold to Siemens Healthcare. This division had already for some time been a supplier of turn-key accelerators for Siemens’ cancer therapy systems.

The German company Accel has been bought by Varian, USA. Bruker Advanced Supercon, Inc has acquired the Research Instruments portion of Varian Medical Systems' ACCEL Instruments GmbH subsidiary in Bergisch-Gladbach to continue and expand this business under two new organizations.

Beam Instrumentation and Controls

European companies engaged in the beam instrumentation and controls development are Bergoz Instrumentation, France; CAEN, Italy; Cosylab, Slovenia; Instrumentation Technologies, Slovenia and Micro Research, Finland. A distinctive characteristic of these companies is that they are small to mid-size enterprises and they nurture long-term customer intimacy. Their main focus is supplying products and services to the accelerator market.

CATEGORIZATION OF PRODUCTS

The products of the accelerator industry can be divided into three groups. First are "off the shelf" products where no variations of the product to satisfy the customer's individual needs are possible. In the second category there are "minor variations" and in the third category the "major variations" products. Minor/major variations can be implemented in the products of the second/third category to meet the individual customer's specific needs. The shares of each category products on the market are shown in Fig. 4.

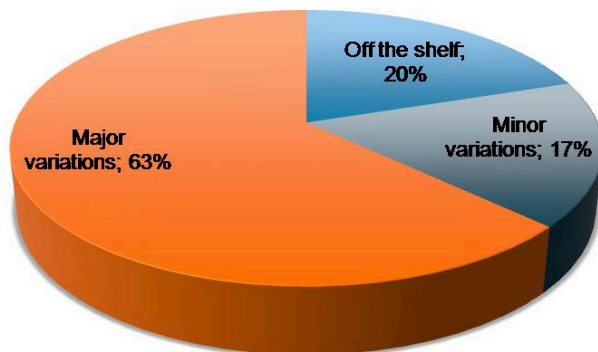


Figure 4: Categorization of the accelerator industry products and their shares on the market.

OPPORTUNITIES FOR RESEARCH INFRASTRUCTURE SUPPLIERS

The accelerator industry has many opportunities for involvement in research infrastructure. The involvement is possible in the various stages of the accelerator life-cycle. For the purposes of this contribution 14 people involved in the accelerator market were interviewed and more than three fourths of them think that the accelerator industry has most opportunities in the construction stage of the accelerator (Fig. 5); 15% see the opportunities in the operational and maintenance stage of the accelerator life-cycle, while less than one tenth think that industry can be involved in the conceptual and design phase.

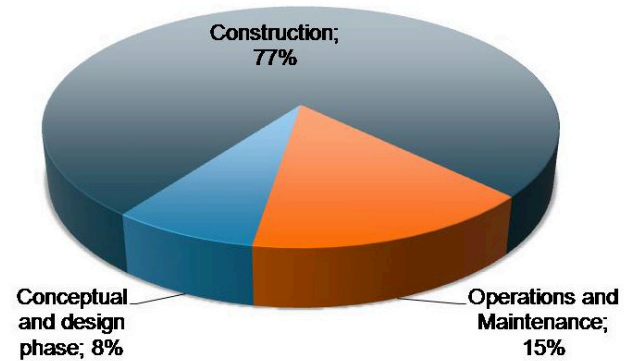


Figure 5: In which phase of the accelerator life-cycle do you see most opportunities for industry involvement? (N=14)

Europe has approximately 300 medium- and large-sized research infrastructures [1]. Viewed as a pyramid (Fig. 6), the top layer would consist of extremely large, unique, facilities, e.g. the Large Hadron Collider (LHC) at CERN. The middle layer would include several of the synchrotrons, and the base would include the remaining medium- and large-sized infrastructures from all scientific fields. Part of the pyramid would also consist of several hundred smaller facilities, working primarily at the national or local levels, but which still play important roles in the European research landscape as resources for the scientific community.

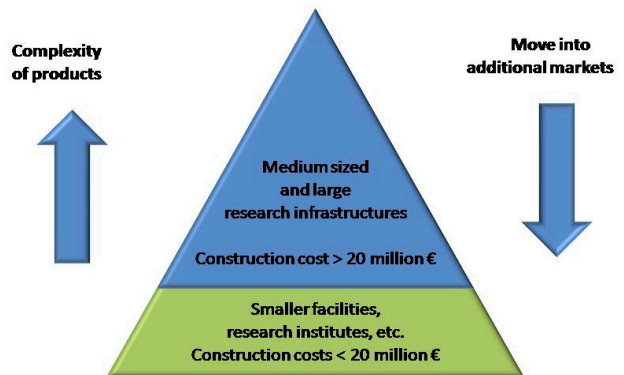


Figure 6: It should be possible for the RI suppliers of complex products to move into additional subsectors of the scientific instrumentation market.

Research infrastructures are perceived to be the premium segment of the "research market" as the requirements of the sector are demanding and challenging, often forming the basis for innovative solutions.

An opportunity for the industry providing complex products for RIs is to move into additional subsectors of the scientific instrumentation market.

EFFECTS OF THE CRISIS

To evaluate the effects of the current economic crises on the accelerator market several questions were set to 14 people involved in this field. 43% of them think that the

crisis will have no effect on construction of new and upgrade of existing accelerators (Fig.7); an almost equal percentages of the rest think that the effect will be negative/positive.

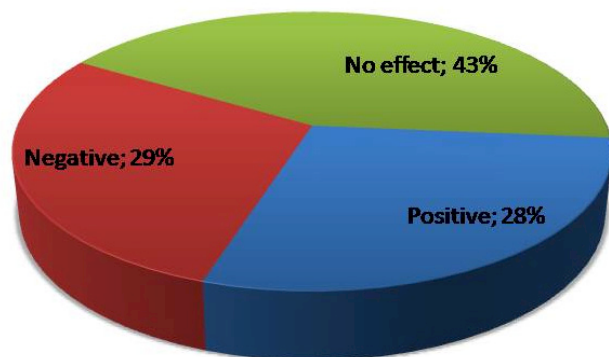


Figure 7: What effect will current economic crisis have on the construction of new and upgrade of existing accelerators? (N=14)

The answers to the question of how the crisis will affect the volume of business between accelerators and industry show that more than one half of the people questioned think that effects will be negative; 23% of them think there will be no effect and the same percentage that the effect will be positive (Fig. 8).

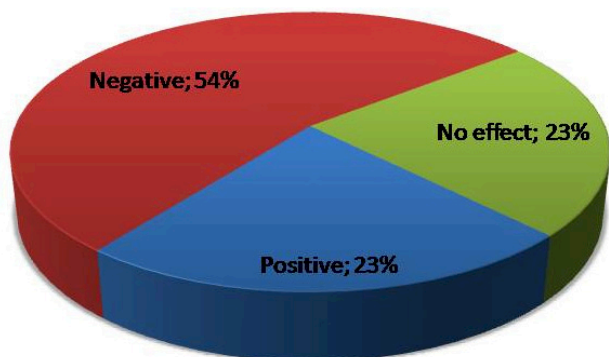


Figure 8: What effect will current economic crisis have in general on the volume of business between accelerators and industry? (N=14)

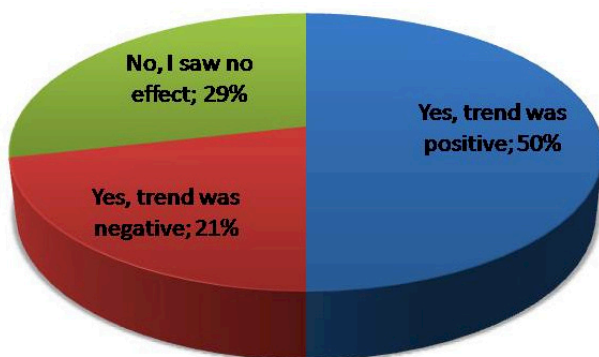


Figure 9: Did you see changes in the trend of outsourcing from accelerator laboratories to your company before the crisis? (N=14)

The next two questions were related to the business between accelerator laboratories and each company questioned. Half of the people questioned said that the trend of outsourcing from accelerator laboratories to their companies before the crisis was positive; 29% saw no changes and 21% think that the trend was negative (Fig. 9).

In the current economic situation 43% think that there is no effect in the volume of their business with laboratories; 36% see negative effects and 21% that the volume of their business is increasing (Fig. 10).

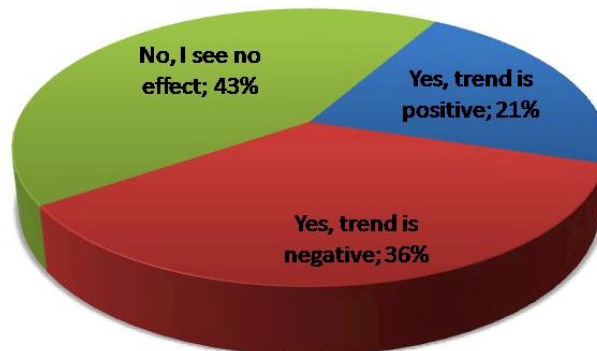


Figure 10: Is economic crisis affecting volume of your business with laboratories? (N=14)

The answer of the governments to the economic crisis was various sorts of stimulus packages that in short term provided boost of the accelerator market. However, in mid-term (3-5 years) government fiscal problems appear and will negatively affect accelerator facility budgets. Therefore a mid-term volume drop of the business between accelerator facilities and industry is expected. As an answer to the decreased budgets and finding themselves with fixed cost for staff the accelerator facilities will decrease the volume of outsourcing to industry and perform the tasks themselves by leveraging their internal resources and cutting on the procurements.

However, the volume of outsourcing from accelerator facilities to industry is expected to increase again in long-term as it is economically more efficient and it incorporates technology changes more easily.

CONCLUSIONS

Europe has dynamic and globally recognized industry players in the accelerator market, two specific cases are presented in this contribution (hadrontherapy, beam instrumentation and controls).

However, there are two overlooked business opportunities, namely operation and maintenance of the accelerators facilities. It is not yet common on bigger European research facilities that industry would involve in these fields although it is already happening with medical accelerators. Japan is leading the way in this field.

Another opportunity is collaboration between RIs and industry in research and development. But although it

looks promising it is very difficult to realize. In collaboration the customers become potential competitors and there is an enormous administrative overhead.

Current economic crisis already have and will continue to have an effect on the volume of the business between accelerators and industry. In addition, delays in construction decisions deeply affect companies, either large or small.

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REFERENCES

- [1] <http://www.eridwatch.eu/>
- [2] http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri