European
Research Infrastructures
Development Watch
(ERID-Watch)

DELIVERABLE D6/D7:

Market Study Final Report

15 September 2008

1 Executive summary

Research Infrastructures (RIs)[1] are key resources for supporting and funding research activities, thus enabling scientists to remain at the forefront of science and technology. European Research Infrastructures not only provide unique opportunities for world-class research and training but also stimulate knowledge exchange and technology transfer, which in turn boosts European competitiveness through the development of new products and new markets.

1.1 The ERID-Watch project

ERID-Watch, funded under the 6th Framework Programme, aims to mutually improve the policy mix of the Member States in order to increase the public investment efficiency for European Research Infrastructures and develop Public-Private Partnerships (PPP) in this context. The project analyse best practices on the RI market, and it will give its final recommendations by the end of 2008.

1.2 Participating Organisations

The ERID-Watch project was financed by the European Commission, as a Coordination Action. The project was initiated by CEA (France), DESY (Germany), STFC (UK), VR (Sweden), IEAP (Czech Republic) and Nenner Conseil (France). Please refer to the Appendices (Glossary) for further details about these organisations.

1.3 Market study activities

Work Package 2 interviewed 44 operating research infrastructures, 8 ESFRI[2] projects, 175 companies (RI suppliers, R&D collaborators or users), and more than 30 institutional representatives (RI funders) in 17 Member States.

1.4 Main conclusions

1. The total annual budgets at European Research Infrastructures are in the region of €8-9bn and almost 50% of this is spent on Instrumentation.
2. An estimate of the 2006 total annual Instrumentation procurement supported by the annual budgets at all European Research Infrastructures is approximately €4.0bn and is expected to grow in the short to medium term. There are significant supply opportunities for industry at existing and future Research Infrastructures, at a national, European and global level.

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[1] RIs refers to facilities, resources and related services used by the scientific community to conduct top-level research in their respective fields. RIs may be ‘single-sited’ (a single resource at a single location), ‘distributed’ (a network of distributed resources), or ‘virtual’ (the service is provided electronically).

[2] The European Strategy Forum on Research Infrastructures is a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach. See: http://cordis.europa.eu/esfri/

3. Taking inflation into account, the annual budget for existing Research Infrastructures (excluding ESA) has shown an average increase of 5.5% per annum over the last 10 years.
4. The opportunities for industry to supply to the planned future ESFRI facilities and to new national RIs are expected to increase this market significantly in the mid term.
5. 56% of Research Infrastructure suppliers have found that supply contracts with RIs have benefited their sales into other (non-RI) markets.
6. About 62% of companies involved in collaborative R&D contracts declared that other market segments have benefited from technologies first developed for Research Infrastructures.
7. Both large companies and SMEs that work successfully with Research Infrastructures are often active in multiple industry sectors.
8. Suppliers believe that their interactions with Research Infrastructures could improve in the areas of contract documentation, communication of sales opportunities, preparatory phases and procurement practices in general.
9. The window of opportunity to address Technology Show Stoppers[3] is limited, but could occur on several occasions during the design and build of a Research Infrastructure. Furthermore, the build of Research Infrastructures have been identified of not always being optimised.

1.5 Main recommendations

1.5.1 Recommendations to Funders

F1. Research Infrastructures as partners are of high importance to the surveyed companies. It has moreover been shown that the Research Infrastructure market is significant and the opportunities need to be better communicated to industry. It would be beneficial if projects on the ESFRI roadmap, and other major planned facilities, could prepare statements on the supply, user and collaborative R&D opportunities that will be created by them. These opportunities could then be collated into a portal for industry, i.e. a website repository of data. This suggestion has been highly recommended by industry representatives.

F2. Funders should consider involving industry as early as possible in planning future Research Infrastructure projects where national systems allow this. These projects should also be well executed adopting a systems analysis perspective.

F3. The European Commission should produce a common financial reporting format for European Research Infrastructures, and organisations such as ESFRI should subsequently promote this. The ERID standard, using classifications such as Internal, Facilities, Instrumentation, Services and Others, represents a good starting point

[3] Technology Show Stoppers are technologies which are required by future Research Infrastructures in order to achieve their scientific objectives, and for which industrial involvement is often necessary.

F4. Procurement processes are complex and diverse across the range of Research Infrastructures surveyed, adding to the complexity of the market. Whilst full harmonisation is unlikely to be possible, funders should take opportunities where possible to enable greater commonality and transparency in procurement processes.

1.5.2 Recommendations to Research Infrastructures

R1. Supply and collaborative R&D opportunities should be gathered in a European portal to increase industry awareness.

R2. Procurement practices should be improved in the areas of contract documentation, communication of sales opportunities, and preparatory phases.

R3. Research Infrastructures should consider involving industry as early as possible in planning future Research Infrastructure projects where national systems allow this. These projects should also be well executed adopting a systems analysis perspective.

1.5.3 Recommendations to Industry

I1. The sum of the procurement opportunities offered by Research Infrastructures is substantial, especially in technology-rich instrumentation areas. Companies should consider the academic market and especially the large-scale Research Infrastructure opportunities as a whole rather than as individual prospects.

I2. Working with Research Infrastructures can stimulate innovation, and have a significant impact on sales into other market segments. Companies should exploit the opportunities at existing and future Research Infrastructures in their mid to long term business strategies.

I3. Companies should look for opportunities to incorporate complementary technologies in their product portfolio.

I4. Companies should build long-term relationships with Research Infrastructures from the early planning stages to anticipate their requirements.

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3 Main report

3.1 Background and objectives

In 2006 the ERID-Watch project was financed by the European Commission, as a Coordination Action. The project was initiated by CEA (France), DESY (Germany), STFC (UK), VR (Sweden), IEAP (Czech Republic) and Nenner Conseil (France).

ERID-Watch aimed 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 Partnerships (PPP) in this context. It was funded under the 6th Framework Programme. The project aimed to:

- better illustrate the public investment in RIs by building a common understanding of this economic mechanism and identifying the current practices devoted to optimise it,
- find strategies to reduce the risk in public spending and to overcome possible impediments in the technical and industrial potential necessary to afford the EU with world class RIs,
- compare and suggest ways for reducing/mitigating risks by considering the involvement of private partners in the investment and operations of the RIs with the support of adequate dispositions to ease participation in procurement markets,
- improve the nature of present customer/supplier relationships into a novel public laboratory/industry Knowledge and Technology (K&T) partnership, in which technology transfer may be associated to industrial property/investment sharing or specific subcontracting activities.

3.2 Introduction

This document comprises deliverables D6 and D7 of the ERID Watch project as agreed with the coordination group at the European Commission.

Research Infrastructures (RIs) are key resources for supporting and funding research activities, thus enabling scientists to remain at the forefront of science and technology. European RIs not only provide unique opportunities for world-class research and training but also stimulate knowledge exchange and technology transfer, which in turn boosts European competitiveness through the development of new products and new markets. This boost in innovation capacity is evidenced through skills flow as a result of public-private mobility, new technologies applied in building novel products, and the creation of spinout companies.

A further element of the impact of Research Infrastructures on the European economy stems from the supply and demand drivers that arise from the construction and maintenance of facilities.

Understanding the way in which the above elements materially affect the economic impact on European industry is of prime importance in increasing the efficiency of public investment in European RIs and developing Public-Private Partnerships (PPP).

The present ERID-Watch project, driven through its market study methodology, is thus intended to evaluate the scale of the RI market and the potential for industrial engagement.

In order to quantify and qualify RIs' interaction with industry, the ERID-Watch project, through its Work Package 2 "Market Study" (WP2) has interviewed the following:

- 44 operating Research Infrastructures
- 8 ESFRI projects (potential future Research Infrastructures)
- 175 companies (RIs' suppliers, R&D collaborators or users)
- More than 30 institutional representatives (RI funders) in 17 Member States

Member States, Research Institutes, universities, RI operators and industrial companies engaged in the project, intending to exchange their experience and policies, in order to build-up recommendations and best-practice methods.

3.3 Methodology

ERID-Watch closely followed the ESFRI categorisation of scientific domains and research infrastructures.

The classification of industrial categories used in this report was established by merging the ESA, CERN and ITER procurement categories together with input from procurement personnel at research infrastructures and other market specialists.

To allow for as many RIs as possible to fit within the sample of this study, no restriction on the level of investments, funding or budget has been determined as a key characteristic. Nevertheless the WP2 analysis has been focused on RIs of high procurement and financial operations to be able to determine the main market and macroeconomics figures. This means that most of the RIs interviewed are medium or large scale infrastructures, and are always operational.

Recommendations from Research Infrastructure procurement departments, as well as official data sources, were used to identify the specific RI suppliers interviewed in this study. The industrial interviews were mostly carried out over the phone by the project's market research specialists. However, in some specific cases the interviewee was visited on site. Analysis was carried out on the material collected, and the statistical reliability for each research question was established. The distinction between different levels of reliability is further explained under section 3.4 below.

The findings of this study were presented at an Industrial Group conference in Brussels in June 2008, and the input given at this meeting was taken into account when distilling the data into the conclusions and subsequently recommendations presented in this document.

The final report was revised by both the WP2 pilot group, the Advisory Board and the Mirror Group, before being dispatched to the European Commission and its subsequent publication.

The approach to evaluation of the market for Research Infrastructures was twofold:

- **Inside-Out**: the study of public investment in RIs
- **Outside-In**: the study of industrial involvement with RIs

Please refer to the Appendices (Methodology) for further details about the methodology used and to the Appendices (Glossary) for a description of the acronyms and abbreviations used in this report.

3.4 Data collected

The data collected during the ERID interviews was both qualitative and quantitative. A significant amount of data was collected, and this was subsequently analysed with a focus on the given research questions. The statistical significance of the data collected was checked, and the following model was used to categorise the reliability of the underlying data and consequently the conclusions drawn.

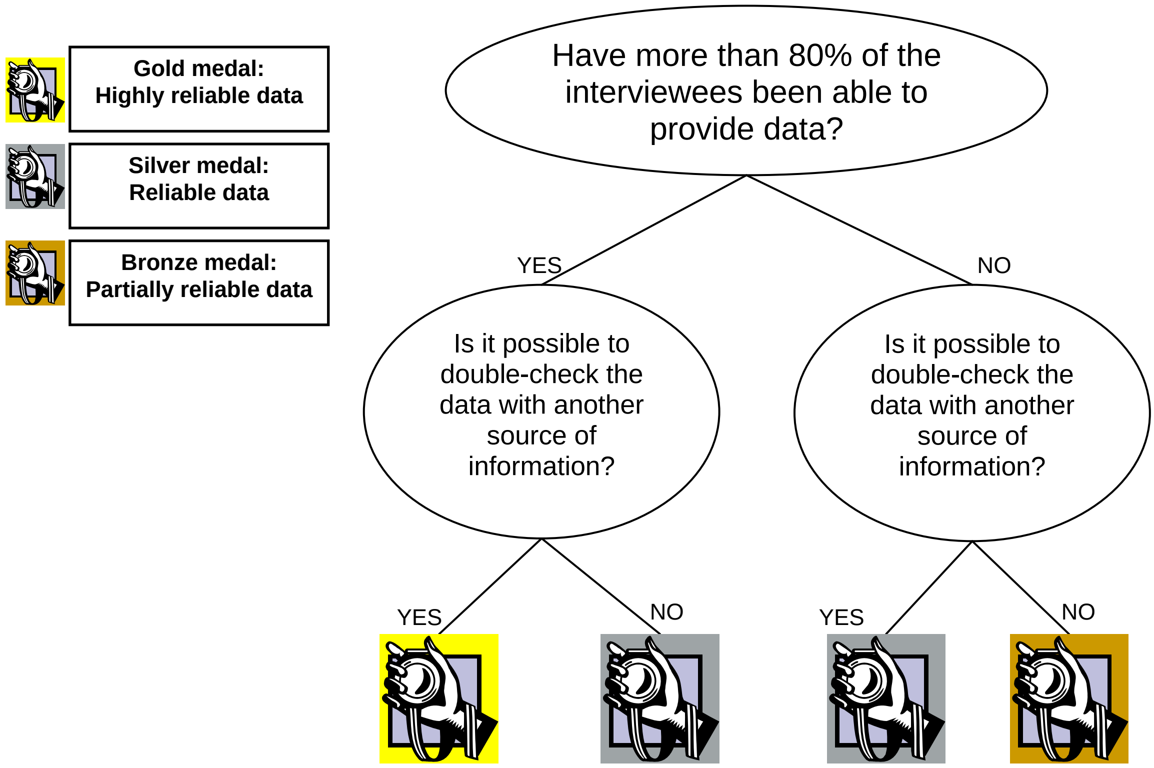


Figure 1. Reliability of data

Throughout the report this labelling has been used to establish the reliability of the underlying data for each conclusion drawn. Please refer to Appendices (Data) for additional data collections, which may be useful background reading for this report.

3.5 Conclusions

3.5.1 Research Infrastructure expenditure

In this section an analysis on how the infrastructures have spent their money is given. The categorisation which has been used is:

- **Internal:** money spent for internal purposes (staff expenditure etc.)
- **Facilities:** money spent on the physical facilities including utilities
- **Instruments:** money spent on instruments, which also includes the experimental infrastructure and technical services
- **Services:** money spent on other services which are not related to the experiments (such as maintenance)

Money not related to any of the above categories, is put under "others". Technical services on sophisticated instruments are often very complex and are therefore included in Instruments as mentioned above, and not in Services.

The following graph illustrates the expenditure breakdown at the interviewed European Research Infrastructures (all expenditures are included).

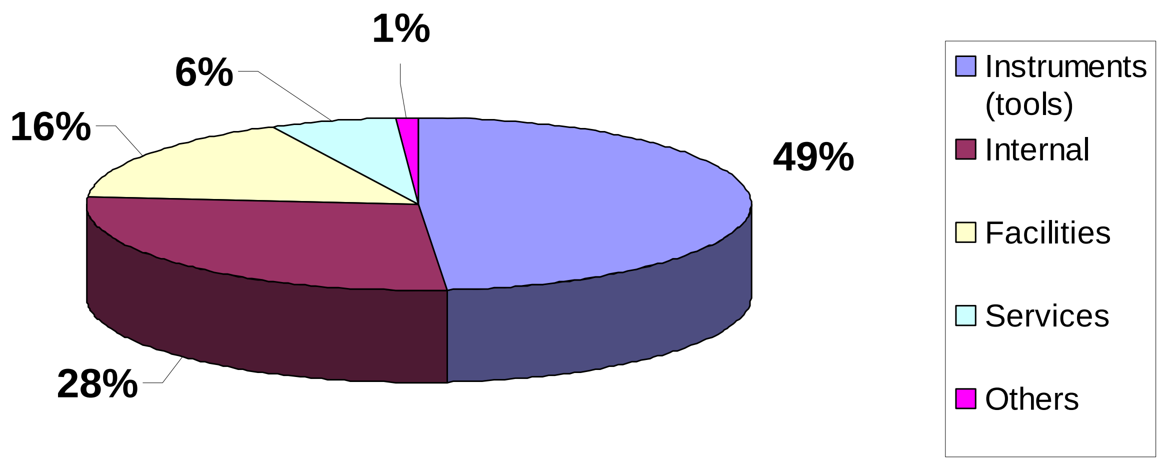


Figure 2. Breakdown of expenditure – interviewed Research Infrastructures

Research Infrastructures spend on average almost 50% of their annual budget on Instrumentation

This figure is of course heavily dependant on the scientific domain served by the RI (Instrumentation is in the range of 24-55%). Please see Appendices (Expenditure breakdown by Scientific Domain) for further details.

3.5.2 Value of the European and global Research Infrastructure Instrumentation market

The interviews with European Research Infrastructures have shown that the total reported Instrumentation (tools) procurement budget at RIs in Europe is in the range of €3.2bn and €3.7bn (for year 2006).

These figures have been adjusted by adding 15% to take account of the subgroups of RIs that have not been identified. See C.4 in Appendices for a further explanation.

	Lower value of total RI Instrumentation procurement in Europe (€bn)	Upper value of total RI Instrumentation procurement in Europe (€bn)
Estimation from full sample	3.2	3.7
Adjusted estimation based on assumption (subgroups not identified)	3.7	4.3

Table 1. Total annual Instrumentation procurement – all European Research Infrastructures

An estimate of the 2006 total annual Instrumentation procurement supported by the annual budgets at all European Research Infrastructures is approximately €4.0bn (the average of €3.7bn to €4.3bn)

Remark: This estimate does not cover the technical procurement related to construction costs.

There were, however, some issues with obtaining this data:

It has proved difficult to establish the full Research Infrastructures instrumentation market due to differences in definitions of a Research Infrastructure and accounting standards

Referring to a UK Sensors & Instrumentation KTN study on the RI Instrumentation market it has been shown that the European RI Instrumentation market constitutes approximately 34.5% of the global market. Please see Appendices (Global RI Instrumentation market) for further details.

There are significant supply opportunities for industry at existing and future Research Infrastructures, at a national, European & global level

RI suppliers should take this full market into account and not only the national market when planning their future sales and marketing strategies.

3.5.3 Research Infrastructure budgets: historic data

The average growth rates (CAGR, 1996-2006 and 2001-2006) of the total annual budgets at interviewed European Research Infrastructures have been as follows:

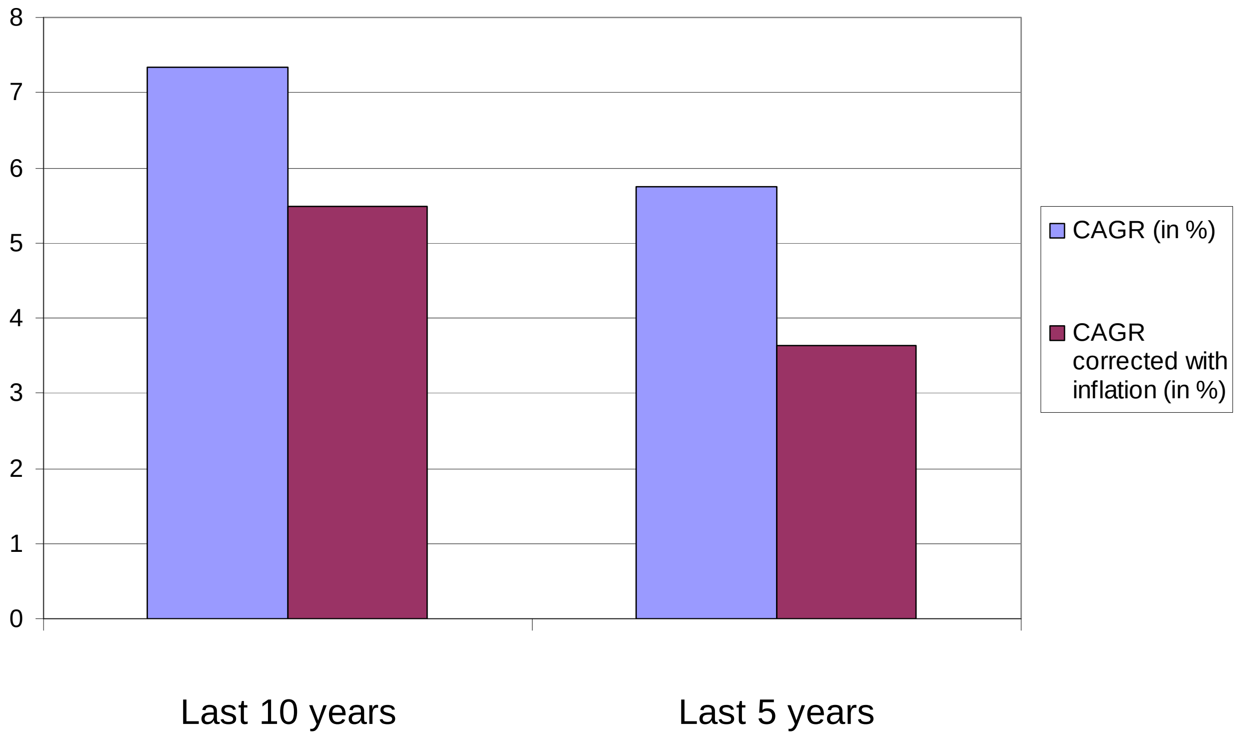


Figure 3. Budget analysis - Research Infrastructures - Historic Data

Official European inflation data (Eurostat) has been used:

- 2.1% / year over the five years period (2001-2006)
- 1.84% / year over the ten years period (1996-2006)

ESA's budget has been excluded in this analysis, as it is large (approximately 40% of the total European RI annual budget), and tends to dominate the trends shown for other RIs. If including ESA's budget the overall RI budgets would have shown a small decrease during the last 10 years.

Taking inflation into account, the annual budget for existing Research Infrastructures (excluding ESA) has shown an average increase of 5.5% per annum over the last 10 years

3.5.4 Forecast for the Research Infrastructure Instrumentation market

Of the interviewed Research Infrastructures, 59% (according to their financial weight) were able to provide quantitative expectations for the future evolution of their budgets. These RIs expected an average growth of slightly less than 8% in the coming five years (2006-2011) which corresponds to an expected growth rate of about **1.5% per year**. If the assumption is made that the inflation rate in the European area would be around 2% on an annual basis during this period, the expected growth rate for existing RIs' budgets would be **-0.5% per year**.

If **ESA** is excluded from the analysis (because its budget is so large that it dominates other trends), the existing RIs have an even more pessimistic view of the future budget evolution, as the expected growth rate then is **-2.4% per year** (taking inflation into account).

If **CERN** is excluded (because its budget will be reducing significantly following completion of the LHC project) but not ESA, the existing RIs however have a slightly more optimistic view of the budget evolution as the expected growth rate is **0.05% per year** (taking inflation into account).

Although investments at existing RIs might decrease in the coming years, the investments into future RIs (both European and national projects) will most certainly ensure that the overall investment into the RI domain will increase year by year. This is also consistent with the interviewed industrial suppliers' positive outlook on the future.

The current EU RI market for instrumentation is approximately €4.0bn and is expected to grow in the short to medium term

3.5.5 Industrial Categorisation of the Research Infrastructure Instrumentation market

The interviewed companies have been sorted into the three categories; Component manufacturers, Equipment manufacturers/System integrators, and Service providers. Engineering and engineering studies, which in the RI domain is of significant importance are categorised under Service Providers. Please see Appendices (Introduction) for further details. The Research Infrastructure Instrumentation market has also been categorised by ERID-Watch into the following nine sectors:

1. Cryogenics, vacuum and gas	**2. Superconductivity**	**3. Electronics**
4. Power management and distribution	**5. Motion and control, autonomous systems, robotics and automation**	**6. Advanced Materials**
7. Optics, optoelectronics	**8. Detectors and Analytical Systems**	**9. Information and Communication Technologies**

These categories cover RI suppliers' capabilities of manufacturing components, integration of systems and providing services in each specific domain. To quantify the relative size of these individual categories, two estimations of the European RI Instrumentation market have been conducted. Estimation 1 is based on the actual sales of products and services to RIs reported by the companies surveyed, while Estimation 2 is based on these companies' estimation of their market share in their sector. For a more detailed explanation of these estimations please refer to the Appendices (Breakdown of the RI Instrumentation market by industrial sectors - Estimation 1 & 2). The two estimations have given the following results - green for Estimation 1 - yellow for Estimation 2:

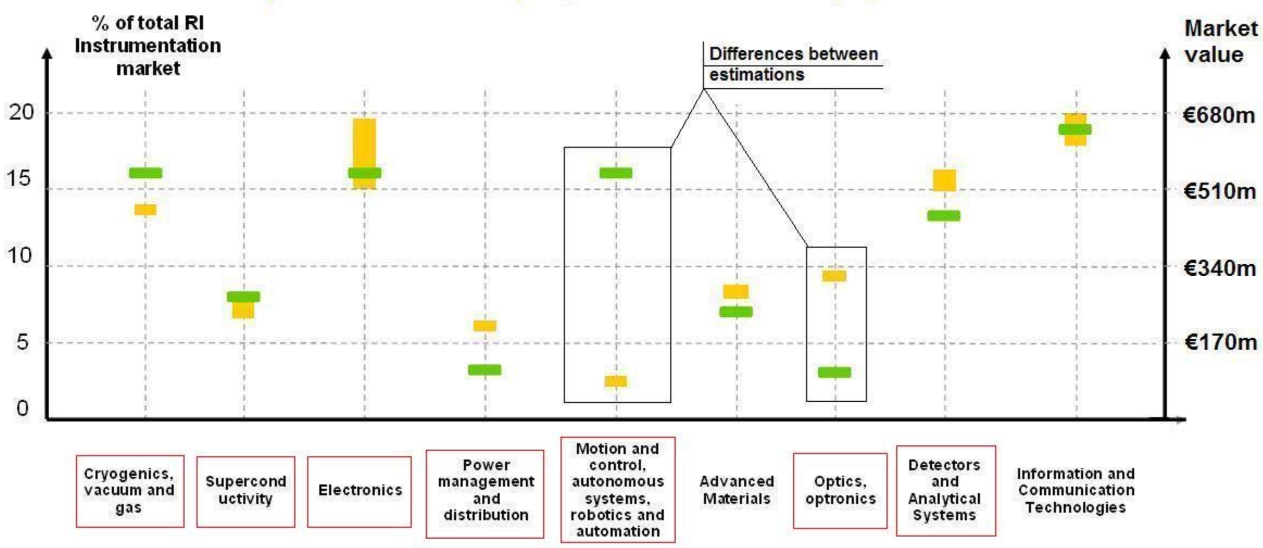


Figure 4. Comparison of Estimations 1 & 2 of European Instrumentation sales to Research Infrastructures – by Industry Sector

The figure above illustrates how large each industrial category is compared to the total RI Instrumentation market according to Estimations 1 & 2. As mentioned earlier an estimate of the 2006 total annual Instrumentation procurement supported by the annual budgets at all European Research Infrastructures is approximately €4.0bn (the average of €3.7bn to €4.3bn). For the sectors in red boxes in the Figure above, please refer to the next Section (Activity in multiple industrial categories).

Some sectors show differences between the two estimations:

- *Motion and control, autonomous systems, robotics and automation*: sector in which information related to market share for sub-sectors of major financial weight have not been given
- *Optics, optoelectronics*: sector in which the RI perimeter often is seen as broad, also wrongly including public laboratories/research centres as customers

Comparing the market share for each industrial sector of the full market, Estimation 1 and 2 show a relatively good match, except for the two sectors mentioned above. However, on the basis that only a few companies (24%) have been able to provide market share data, Estimation 1 is probably the more accurate of the two.

Only a few companies (24%) have been able to provide market share data

3.5.6 Activity in multiple industrial categories

An analysis of the level of companies' activity in multiple industrial categories has been carried out. Selling products from multiple industrial categories would probably imply that a cross fertilisation of capabilities (knowledge, technology etc.) between these categories is taking place. Three levels of cross fertilisation have been established:

- High level of cross fertilisation; which is defined as >60 % of companies selling products/services from the category also selling products/services from other categories.
- Medium level of cross fertilisation; which is defined as <60% but >30% of companies selling products/services from the category also selling products/services from other categories.
- Low level of cross fertilisation; which is defined as <30 % of companies selling products/services from the category also selling products/services from other categories.

Companies in the following categories show in general a **high level of cross fertilisation**:

- Cryogenics, vacuum and gas

- Superconductivity
- Electronics
- Power management and distribution
- Motion and control, autonomous systems, robotics and automation
- Optics/optoelectronics
- Detectors and Analytical Systems

Companies in the following categories show in general a **medium level of cross fertilisation**:

- ICT

Companies in the following categories show in general a **low level of cross fertilisation**:

- Advanced materials

Please refer to Appendices (Cross Fertilisation) for further details.

The study has covered all company sizes, as of the surveyed companies 17% were micro (<10 employees), 32% were small (<50 employees), 30% were medium (<250 employees) and 21% were large companies. Please see Appendices (Introduction) for further details.

It has therefore been shown that:

Both large companies and SMEs that work successfully with Research Infrastructures are often active in multiple industry sectors

3.5.7 Research Infrastructure Instrumentation market and its closely related market segments

The company interviews have shown that the Research Infrastructure instrumentation market is a highly demanding segment. Therefore, as a supplier to this market, **it should be possible to move into additional subsectors of the scientific instrumentation market.** The ability to provide references from the RI market to new customers in the scientific market is likely to be regarded as a strong asset. As evidence to this, the ERID survey has shown that 56% of the interviewed RI suppliers quote that the RI supply contracts have improved sales in other market segments.

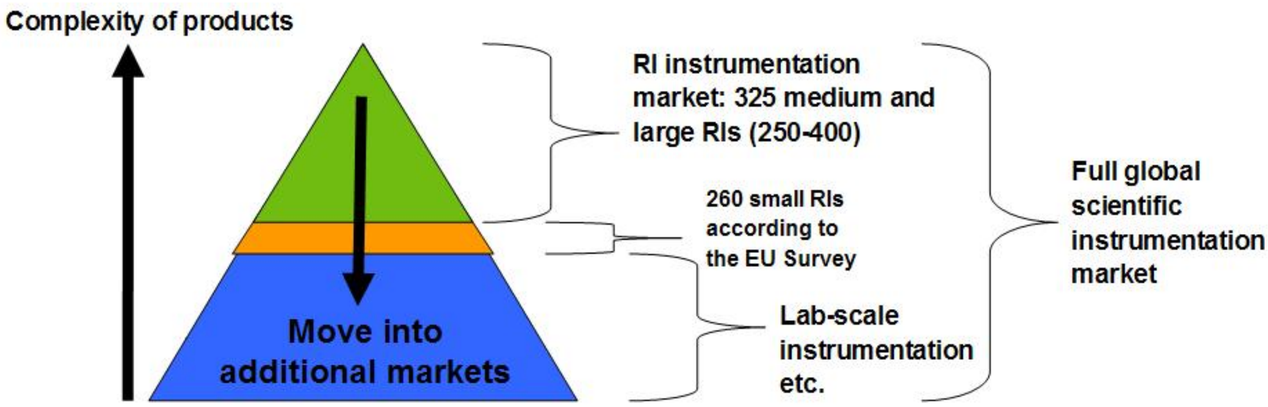


Figure 5. Pyramid of complexity – Scientific Instrumentation Market

> **56% of Research Infrastructure suppliers (92 of 165) have found that supply contracts with Research Infrastructures have benefited their sales into other (non-RI) markets**

Furthermore, 62% of companies involved in collaborative R&D contracts with RIs, have found that these benefited their other market segments. Please refer to Appendices (Technology Transfer) for further details.

> **62% of companies involved in collaborative R&D contracts (43 of 69) declared that other markets segments have benefited from technologies first developed for Research Infrastructures.**

It is clear that both supplying products and services to RIs and collaborating with these, has had a significant importance for the companies surveyed.

3.5.8 Possible improvements of the business climate

The interviewed Research Infrastructure suppliers have been asked if improvements could be made with regards to:

- Contract documentation (shorter, clearer)
- Communication of project (sales) opportunities
- Procurement practices in general
- Preparatory phase
- Quality requirements (clearer)

The aggregated answers to these questions are shown in the graph below:

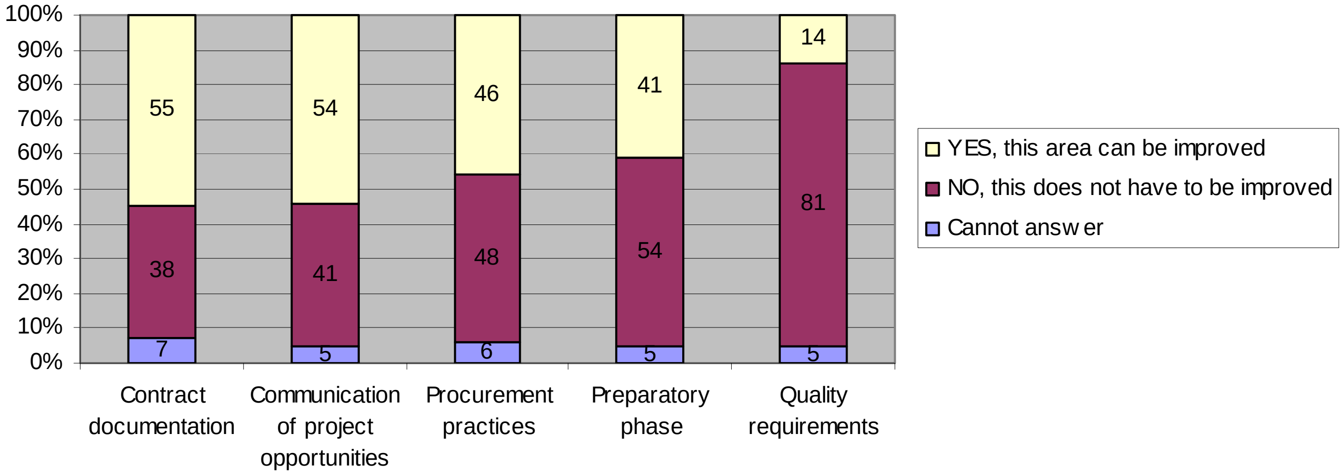


Figure 6. Improvements to Business Climate

Suppliers believe that their interactions with Research Infrastructures could improve in the areas of contract documentation, communication of sales opportunities, preparatory phases and procurement practices in general

A European RI portal incorporating project (sales), collaborative R&D and user opportunities could be a means to resolve the communication issue above (e.g. website repository of data). Furthermore, it has been shown that procurement processes are complex and diverse across the range of Research Infrastructures surveyed, adding to the complexity of the market.

It has though been shown that RIs' quality requirements are generally very clear. This should be positive news for the RI procurement departments.

3.5.9 Future Research Infrastructures

3.5.9.1 Construction cost for the ESFRI RIs

The European Strategy Forum on Research Infrastructures is a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach. ERID-Watch has decided to look at these projects as ESFRI is the leading European forum where initiatives for multilateral research infrastructures are initiated. The information concerning the RI projects listed in the ESFRI Roadmap gives the following figures:

- 35 future RIs
- Total construction costs for ESFRI RIs : €13.6bn

As described in the Appendices (Number of medium and large RIs), the estimate for existing RIs is based on the following:

- 325 medium and large scale RIs (the average of 250 and 400)

– Total cumulative construction cost, excluding ESA (in 2006) : €33.85bn (the average of €27.1bn and €40.6bn)

The breakdown of the average construction cost of one RI in each scientific domain is represented by the graph below:

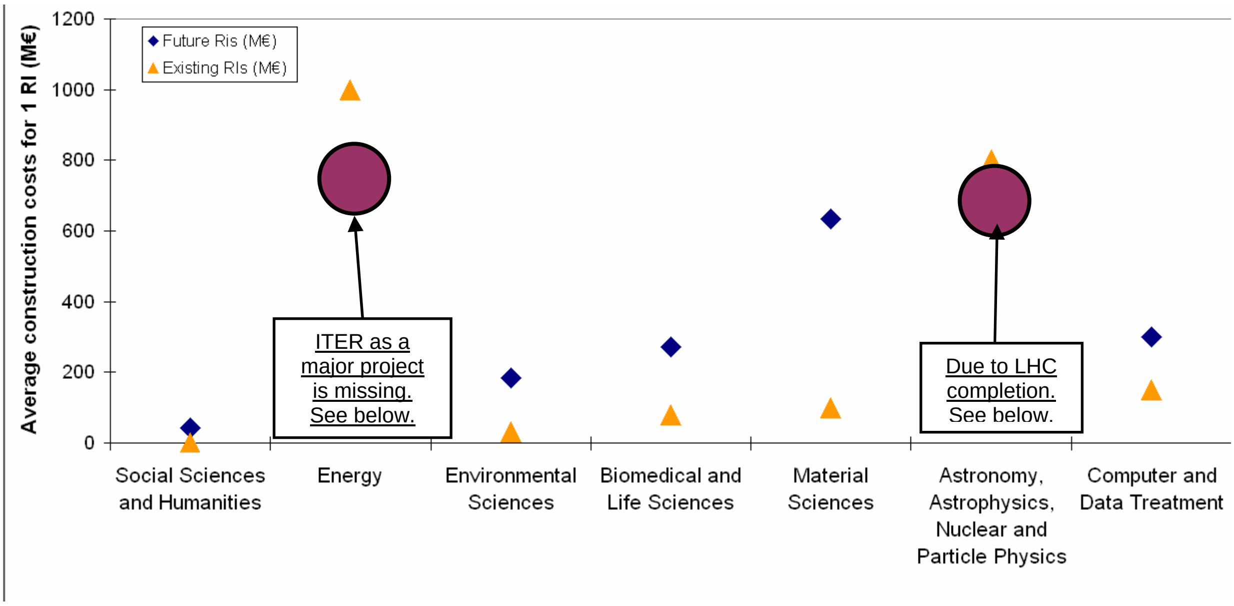


Figure 7. Average construction cost – Existing and future Research Infrastructures

Remarks:

As the ITER project is not included in the ESFRI Roadmap, this results in a much lower value for the expected average future construction cost than the *true* value for all future RIs in the Energy domain, as indicated above.

The construction of LHC which was an expensive project, has resulted in a spike in construction budgets for existing RIs in the Astronomy, Astrophysics, Nuclear and Particle Physics domain as shown above.

One conclusion which could be drawn from this graph is that the investment into future RIs, which are listed in the ESFRI Roadmap, shows a trend towards larger, more expensive facilities compared with those funded in the past.

The following graph shows the total level of investment into existing RIs by scientific domain:

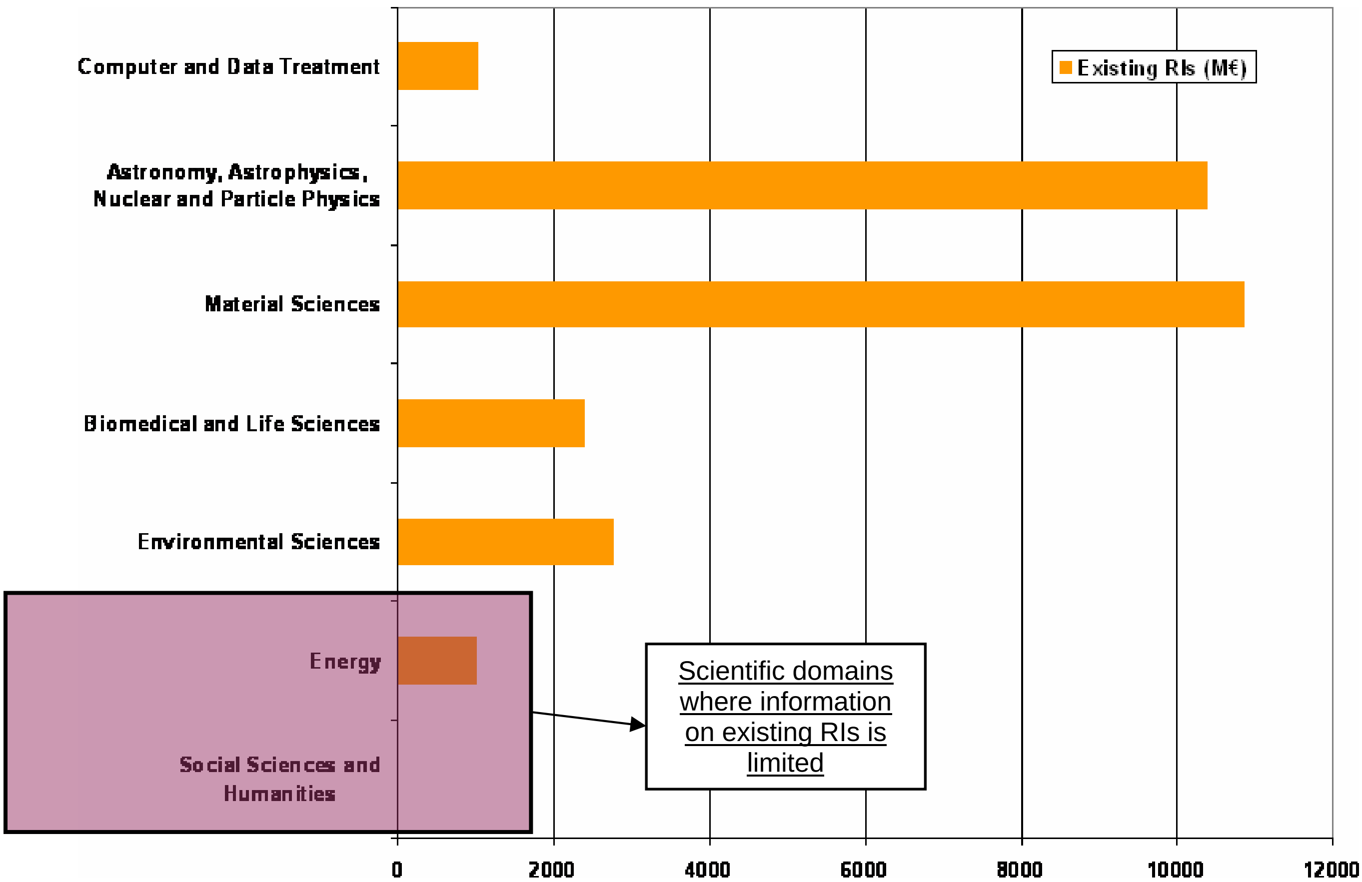


Figure 8. Total level of investment into future ESFRI Research Infrastructures – by scientific domain

If comparing this data to the RIs within the ESFRI Roadmap, the conclusion could be drawn that if all the ESFRI projects are implemented, the construction of these will represent 30% to 70% (depending on the scientific domain) of the total construction cost for the existing RIs.

The expected budgets available for construction of new RIs, listed in the ESFRI Roadmap are substantial. A number of other national RIs will be built in the coming decades. This naturally means that the total level of investment into all future European RIs will be significantly higher than the figures above show.

The opportunities for industry to supply to the planned future ESFRI facilities and to new national RIs are expected to increase this market significantly in the medium to long term

The size of contribution from the ESFRI projects to the instrumentation market, will certainly depend on the number of these projects which eventually are funded.

3.5.9.2 Trends in financing the ESFRI Research Infrastructures

The information in this section relies on interviews with 8 projects listed in the ESFRI roadmap. These projects have been selected to be interviewed based upon the following criteria:

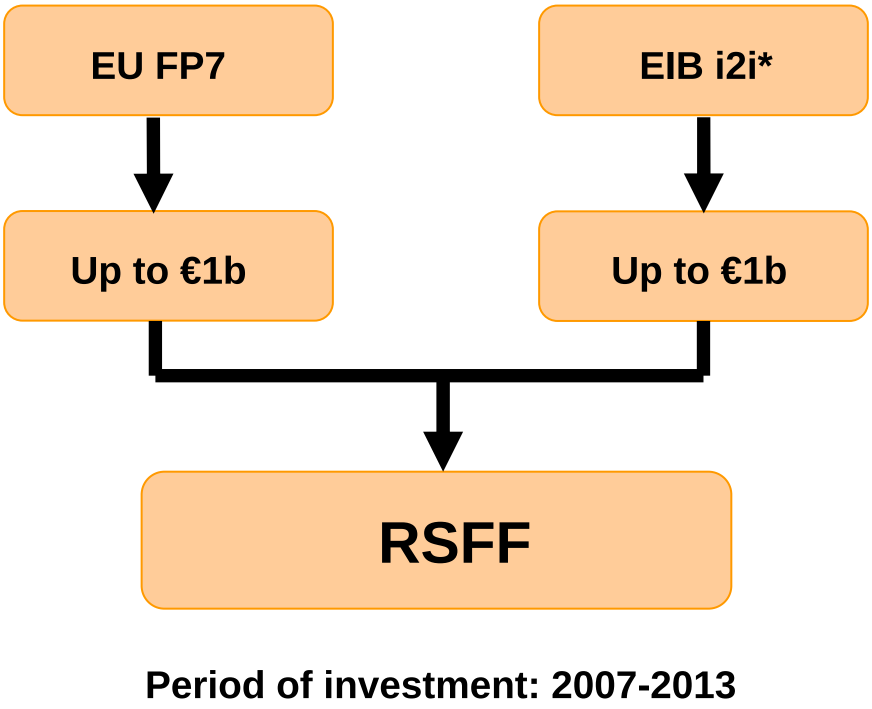
- Emphasis has been put as much as possible on advanced projects, with the nearest expected date of operation
- All scientific sectors have been covered, except Energy

As a result of these criteria, most of the projects are distributed Research Infrastructures. These facilities have in particular highlighted the following issues:

- Governance : the demand for a specific legal status is high
- Financial involvement:
    - Local public bodies' funding is very small or even missing (only up to 5%) as the economic impact of such projects at local level is expected to be negligible
    - A strong investment from a European level is requested (in the range of 20% to 30%) as the benefit of distributed RIs would be important for the whole European community

3.5.9.3 New schemes of funding – the RSFF

In June 2007 the European Investment Bank (EIB) and the European Commission signed a cooperation agreement to initiate the risk-sharing finance facility (RSFF). The RSFF is a new financial instrument which is financing research and innovation projects in Europe. The RI domain is one of the targeted groups for this financial instrument. The RSFF is part of the EIB's programme for Research & Innovation and EU's 7th Research Framework Programme. The financial contribution to the instrument totals €2 billion (€1bn each from FP7 and the EIB). The RSFF is expected to unlock additional funding from other parties, which otherwise would not have been available for the Research Infrastructure domain



***i2i: Innovation 2010 Initiative**

Figure 9. EIB Investment scheme – RSFF

The EIB has already financed various projects in the RI domain, for instance LHC/CERN, EMBL-Heidelberg, Trieste-Free Electron Laser and IMEC.

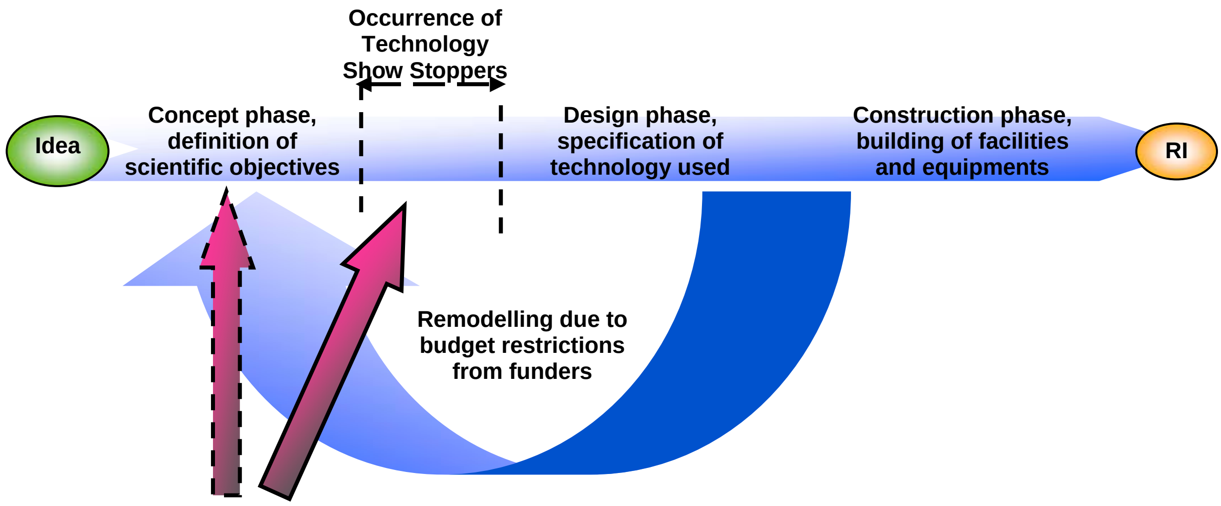
By the end of 2007, the RSFF had committed €459 million to new research projects.

3.5.10 Technology Show Stoppers

Technology Show Stoppers are technologies which are required by future Research Infrastructures in order to achieve their scientific objectives, and for which industrial involvement is often necessary. From the information provided by 8 ESFRI projects, these Technology Show stoppers have rarely been identified, mainly because:

– Several RI projects have not yet decided the technical platform they will choose (still in the preparatory phase)
– Some RI projects are at an advanced phase and have already discussed the issues with industry, which means they already know that their requirements will be fulfilled. This should imply that industry has so far been able to solve the technical issues presented successfully.

The following illustration depicts how narrow the window of opportunity could be for industry to engage with RIs to address the Technology Show Stoppers:



Companies need to be involved at the earliest possible stage, in order to **ensure adequacy of scientific needs and industrial capabilities**

Figure 10. Development phases - Research Infrastructures

As shown above, it has been difficult to identify specific Technology Show Stoppers during the discussion with existing and future RIs, as a very limited number of these are in the narrow window of opportunity described.

Tenders for products with highly detailed descriptions of design criteria need preparatory collaboration phases so companies may find a balance between potential solutions and costs. Funders and RIs should get industry involved as early as possible in planning future and existing RI projects, allowing companies to build long-term relationships with RIs from the early planning stages and anticipate their requirements.

Also when the build of a research facility has been initiated, it is necessary to continuously improve and optimise the project. A *systems analysis* perspective would in particular be beneficial to have. It is furthermore important to keep a clear vision of the global project and all constraints involved, and not only look at the components required.

The window of opportunity to address Technology Show Stoppers is limited, but may occur on several occasions during the design and build of a Research Infrastructure.

The build of Research Infrastructures have been identified of not always being optimised.

3.6 Recommendations

3.6.1 Recommendations to Funders

F.1 Research Infrastructures as partners are of high importance to the surveyed companies. It has moreover been shown that the RI market is significant and the opportunities need to be better communicated to industry. It would be beneficial if projects on the ESFRI roadmap, and other major planned facilities, could prepare statements on the supply, user and collaborative R&D opportunities that will be created by them. These opportunities could then be collated into a portal for industry, i.e. a website repository of data. This suggestion has been highly recommended by industry representatives.

62% of companies involved in collaborative R&D contracts declared that other markets segments have benefited from technologies first developed for RIs.

56% of RI suppliers have found that supply contracts with RIs have benefited their sales into other (non-RI) markets.

An estimate of the 2006 total annual Instrumentation procurement supported by the annual budgets at all European RIs is approximately €4.0bn.

However, 54% of the interviewed companies believe that communication of project opportunities could be improved.

F.2 Funders should consider involving industry as early as possible in planning future Research Infrastructure projects where national systems allow this. These projects should also be well executed adopting a systems analysis perspective.

41% of the interviewed companies believe that the pre-preparatory phase in supplying RIs could be improved.

The window of opportunity to address Technology Show Stoppers is limited, but could occur on several occasions during the design and build of an RI. The build of Research Infrastructures have been identified of not always being optimised.

F.3 The European Commission should produce a common financial reporting format for European Research Infrastructures, and organisations such as ESFRI should subsequently promote this. The ERID standard, using classifications such as Internal, Facilities, Instrumentation, Services and Others, represents a good starting point

The ERID-Watch study found it difficult to establish the full RI instrumentation market due to differences in definitions of an RI and accounting standards.

F.4 Procurement processes are complex and diverse across the range of Research Infrastructures surveyed, adding to the complexity of the market. Whilst full harmonisation is unlikely to be possible, funders should take

opportunities where possible to enable greater commonality and transparency in procurement processes.

Suppliers believe that their interactions with Research Infrastructures could improve in the areas of contract documentation, communication of sales opportunities, preparatory phases and procurement practices in general

3.6.2 Recommendations to Research Infrastructures

R.1 Supply and collaborative R&D opportunities should be gathered in a European portal to increase industry awareness

54% of the interviewed companies believe that communication of project opportunities could be improved.

The idea is to use the existing Knowledge and Technology Transfer teams at Research Infrastructures in order to improve the communication and establish useful relationships with industry.

R.2 Procurement practices in several areas should be improved.

55% of the interviewed companies believe that contract documentation could be improved.

46% of the interviewed companies believe that procurement practices in general could be improved.

R.3 Research Infrastructures should consider involving industry as early as possible in planning future Research Infrastructure projects where national systems allow this. These projects should also be well executed adopting a systems analysis perspective.

41% of the interviewed companies believe that the pre-preparatory phase in supplying RIs could be improved.

The window of opportunity to address Technology Show Stoppers is limited, but could occur on several occasions during the design and build of an RI.

3.6.3 Recommendations to Industry

I.1 The sum of the procurement opportunities offered by Research Infrastructures is substantial, especially in technology-rich instrumentation areas. Companies should consider the academic market and especially the large-scale Research Infrastructure opportunities as a whole rather than as individual prospects.

There are significant supply opportunities for industry at existing and future RIs, at a national, European and global level.

The current EU RI market for instrumentation is approximately €4.0bn and is expected to grow in the short to medium term.

Research Infrastructures spend on average almost 50% of their annual budget on Instrumentation.

Only a few companies (24%) have been able to provide market share data.

I.2 Working with Research Infrastructures can stimulate innovation, and have a significant impact on sales into other market segments. Companies should exploit the opportunities at existing and future RIs in their mid to long term business strategies.

56% of RI suppliers have found that supply contracts with RIs have benefited their sales into other (non-RI) markets.

62% of companies involved in collaborative R&D contracts declared that other markets segments have benefited from technologies first developed for RIs.

The opportunities for industry to supply to the planned future ESFRI facilities and to new national RIs are expected to increase this market significantly in the medium to long term.

I.3 Companies should look for opportunities to incorporate complementary technologies in their product portfolio.

Both large companies and SMEs that work successfully with RIs are often active in multiple industry sectors.

I.4 Companies should build long-term relationships with Research Infrastructures from the early planning stages to anticipate their requirements.

The window of opportunity to address Technology Show Stoppers is limited, but could occur on several occasions during the design and build of an RI.

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