European Commission

Community Research

User-friendly Information Society

IST Programme

Integrated Programme Portfolio Analysis (IPPA)

Report on the analysis done following the third IST call

February 2001

www.cordis.lu/ist

European Commission

IST programme

Integrated Programme Portfolio Analysis (IPPA)

Report on the analysis done following the third IST call

February 2001

www.cordis.lu/ist

CONTENTS

1 Executive summary

Objectives: Portfolio analysis and linking to the programme's vision

Following the evaluation of the 3rd call of the IST programme, an interdisciplinary team of 19 independent experts has analysed the portfolio of projects resulting from the first three calls. The objectives were to provide a programme level overview on the response to the calls, an analysis of the participation in the programme, the development of the portfolio against the programme's vision and priorities, and suggestions for topics for cross programme clustering.

In the first IST call, Action Lines from all the programme Key Actions (KAs) were open and the retained projects address both technologies and applications. Almost half of the funded projects in call 2 were focussed on Take-up actions, and call 3 covered mainly Action Lines from KA1, KA2 and KA3, which are application oriented.

Balanced portfolio coverage in terms of technologies and applications.

The programme has a wide coverage of activities addressing technologies and applications from various angles and provides a unique opportunity for building partnerships and consolidating effort across the European industrial and academic research communities. Following the first three calls, critical mass is building up in important areas such as agent technologies, sensors and embedded technologies, mobile and wireless communications and systems, and multi-modal interfaces.

Emphasis on proof of concepts; paradigm shifts are sought in applying the technology

Almost a quarter of the RTD projects are targeting at proof of concepts and early prototyping. This is in line with the major interest of industry in collaborative research: undertaking "groundbreaking" research collectively to share risk and, at a later stage, exploiting results at an individual level.

An analysis of the level of "trend-break" was done for call 3 projects (to be confirmed for the rest of the portfolio in next exercises). It shows that although a large number of projects are aiming at incremental shifts in technology development, many address paradigm shifts in applying the technology in working processes and practices.

'Standard' consortium profile almost irrespective of type of research activities addressed

There seems to be a tendency of proposers across the programme to set up consortia with a similar kind of profile, almost irrespective of the technological nature of the project. The 'typical' RTD project has 7-8 participants, gets 1,8 mEuro funding and projects have a standard mix of types of participants. This results in an average funding per participant of 150.000 Euro a year. The programme does not seem to allow yet for different sizes of projects and structures to emerge.

The gap in research addressing the 5-10 year time frame is confirmed, call 3 has not corrected this trend

IPPA following call 2 stated that there is a gap in supporting RTD with a 5 to 10 year horizon and that the programme needs to address the longer time perspective. For most IST-markets (e.g.

eCommerce being an exception) 5 years is the dividing point between business planning and longer-term strategy. This 'time gap' has again been confirmed in call 3. This could be partly due to the fact that call 3 is relatively applications' oriented. Only two Action Lines of KA4 were called for in Call 3. The discussion following the IPPA2 report resulted in a stronger focus in Workprogramme 2001 on long-term/high reward projects. Call 3 is still based on Workprogramme 2000.

The 'time gap' could result in a lack of European strength relating to the introduction of technologies beyond basic Internet and World Wide Web services in the timeframe beyond 2005.

Strong focus on market opportunities, one in five projects have clear high-risk/high-reward profile

The majority of the projects from calls 1-3 have times to market, which fall within their market opportunity windows. This suggests that there is a good correspondence between the content of the programme and industry planning. Projects that deliver results beyond the market opportunity window normally aim at the next generation of products and services. The degree of innovation is critical to the success of these projects. If they are highly innovative, such projects would have a high-risk/high-reward profile. Several of these projects are in the Future and Emerging Technologies (FET) area and are highly innovative in terms of future generation products and services.

When analysing the correlation between the level of technological risk in Call 3 projects and the estimated size of the target markets, it was found that approximately 1 in 5 projects have clear high risk/high reward profile, and a majority of projects aim either at medium to high technological risk or medium to large market sizes.

The socio-economic analysis shows that Call3 projects have a balanced risk profile regarding adoption of results by end-users.

Cross programme clusters are proposed to create synergies and improve impact

Clustering is a means to further enhance the building of critical mass. Clustering of projects appears to be less than expected following call 3. Possible topics for cross programme clustering are suggested by the IPPA3 team and include agent technologies, sensors, smart cards, and information interfaces. It is recommended that an internal team from the programme further explores the added value and implementation of clusters in the suggested topics. Fewer projects than expected (around 10) were found to address third generation mobile UMTS applications and services although more than 35 projects address mobile and wireless applications.

Stronger link between the Programmes vision and the portfolio of projects

The 3rd call is the first IST call based on the Programmes' vision, which was integrated in Workprogramme 2000. 70% of the RTD-projects in call 3 contribute significantly to progress in the technologies identified by the programme advisory group (ISTAG) as key enablers for realising the vision. This is an increase in comparison with call 1 (40% contributing significantly) and call 2 (60% contributing significantly).

Opportunity to build on visionary work done to anticipate future development in the field

Many of the research themes of the FET projects will reach the market and mainstream research and development much sooner than anticipated one or two years ago (e.g. agents, virtual reality, interactive media). This offers the IST Programme the opportunity to build on work done in FET and

increase the proportion of resources devoted to these themes thereby strengthening the European position in these emerging industries.

2 Introduction

This report contains the findings of the Integrated Programme Portfolio Analysis (IPPA) following the 3rd IST call for proposals. This study was conducted by 19 independent experts during the week of 10 to 17 December 2000. The names of the team members are given in Annex 1.

The structure and approach for the study were based on the results of and the lessons learned from the IPPA report in May 2000 following the second call and the Programme Integration and Management Study (PIM) undertaken in July 1999 following the first IST call. Both reports can be found on http://www.cordis.lu/ist/cpt/2000ippa.htm.

2.1 Objectives

The IPPA study aims at:

- Providing a programme level:
  - Overview on the response to the third IST call.
  - Aggregated analysis of the programme portfolio of projects.
- Analysing the participation in the programme, including the constituency attracted.
- Analysing the trends in the development of the portfolio of projects against:
  - The programme's vision and priorities.
  - The workprogramme content.
- Identifying possible clustering topics.
- Providing results that feed into workprogramme drafting and the discussion on the 6th Framework Programme.

2.2 Approach

The baseline information provided to the team was the set of 239 projects that had been proposed for funding[1] following the 3rd call evaluation, together with the abstracts of the 555 projects funded in the first call and the abstracts of the 251 projects funded in the second call. This was supplemented by the evaluation and implementation reports for the third call and the Commission's database.

The methodology used in the PIM and the IPPA report following call 2 has been further expanded and refined. As a first step, following recommendations of both the programme committee (ISTC) and the advisory group (ISTAG), the Technology and Market categories used in the former IPPA-report were revised and agreed upon in order to have a more coherent classification across the various parts of the analysis. The projects of call 1 to 3 were then classified according to the new categories, by reading through the summaries of the projects of call 1 and 2, and the full proposals of call 3.

[1]The IPPA exercise analyses the portfolio of projects selected for funding. These represent 23% of proposals submitted to the first three calls. The Commission has made an analysis of non-selected proposals in calls 1-3. About 83% of failed proposals do not meet the threshold for criterion 1 related to scientific and technological quality and innovation.
Of the proposals in call 1-3 which were ranked but not retained , about 75% scored a "3" on the first criterion and 25% scored a "4". Of the proposals selected for funding, 31% scored a "3", 59% scored a "4" and 10% scored a "5".
A first conclusion would be that projects are mainly selected on their degree of scientific quality and innovation.

As a next step each proposal from the 3rd call was classified according to:
• Technologies used
• Industry and service sectors addressed
• Time to market
• Relevance to the IST programme vision

Plenary sessions were held once a day. The initial sessions were particularly focused on methodological issues concerned with the new technology and industry/service sector categories, risk and socio-economic analyses and the introduction of new methodologies to analyse the portfolio of projects:

- Output of projects expected
- Evolutionary and paradigm shifts
- Technological challenges versus potential market size addressed
- Socio-economic issues addressed

The team then was divided into small working groups that analysed specific themes: e.g. the constituency attracted, the support measures, the socio-economic impact, the time to market and the risk analysis and possible clusters. Hypotheses were tested by mining the projects' database and re-reading projects.

The working groups reported back at plenary sessions, where other members of the team could provide additional input to their discussions. These sessions were also used to develop an integrated picture of the 1st, 2nd and 3rd calls.

An overall structure for the report was agreed and a rapporteur drafted the IPPA-report, based on the input of the team members. Team members then commented on the text and finalised conclusions by e-mail in order to deliver the final version of the report.

3 Technologies and Industry/Service sectors addressed

3.1 Introduction

This chapter presents an overview of the portfolio of projects in terms of technologies and targeted industry and service sectors. It also considers topics suggested for cross programme clusters and the expected output of projects. Table 1 below shows the break down of the three calls according to the type of project [2]and funding.

Call No.	Project type	No. Projects	Total Funding (mEuro)
Call 1	RTD Projects	468	869
	Take-Up Actions	21	23
	Support measures	66	52
	Total	555	944
Call 2	RTD Projects	94	180
	Take-Up Actions	126	82
	Support measures	31	30
	Total	251	292
Call 3	RTD Projects	187	372
	Take-Up Actions	4	2,5
	Support measures	47	42
	Géant[3]	1	80
	Total	239	496,5

Table 1: Breakdown of 1st, 2nd and 3rd calls by project type/funding

Call 3 was relatively application oriented with most projects in KA1, KA2 and KA3. KA4 had few projects because only two Action Lines were addressed.

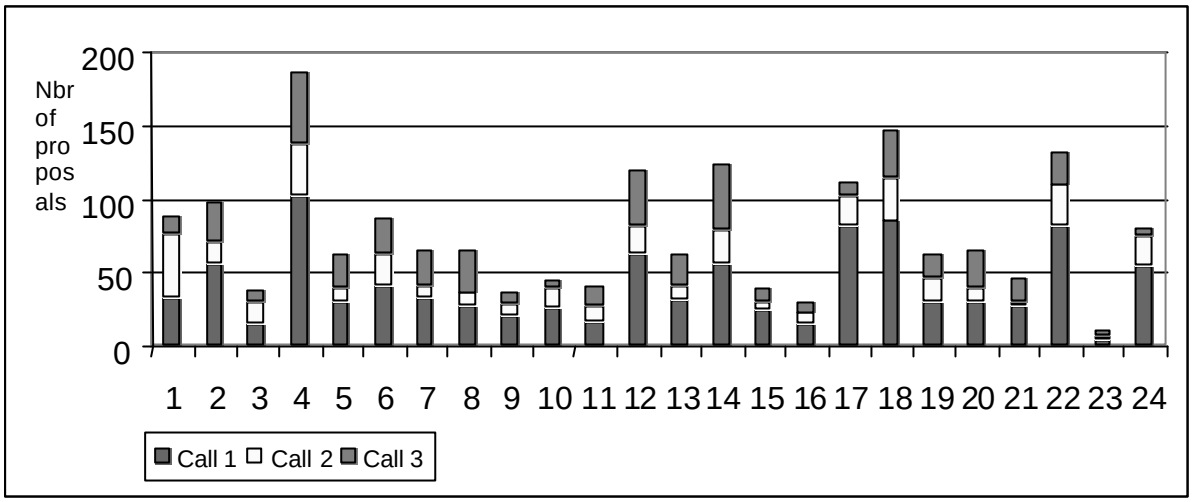
3.2 Technologies and Industry/Service Sectors

The team identified the main technologies addressed and the targeted Industry and Service Sectors in the three calls. These are presented in Table 2[4] .

[2] The proposals of FET Open step 1 and of the SME exploratory awards are not included because they are aimed at preparing full proposals.

[3] The Géant project aims at putting in place a shared multibit, gigabit core network available to all of the national research networks across Western, Central and Eastern Europe.

[4] For an explanation of the categories used see annex 2 and 3. Some projects address more than one technology or industry/service sector. The team-members were asked to indicate the main technologies/ industry & service sectors addressed.


Nbr of proposals
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Call 1
Call 2
Call 3

1	Software Engineering	13	Network management
2	Middle-ware and distributed systems	14	Mobile and wireless communications
3	Dependable systems and infrastructures	15	Switching, routing and communication systems
4	Knowledge and information management	16	Computing architectures
5	Agent technologies	17	Micro and opto-electronics
6	Optimisation tools and decision support systems	18	Micro-systems and sensors
7	Content authoring tools	19	Signal and data processing and conditioning
8	Trust and security	20	Multi-modal multi-sensoral interfaces
9	Supply chain management and generic organisational tools	21	Language and speech technologies
10	Simulation and CAD/CAM	22	Visualisation, virtual environments and image processing
11	Embedded systems	23	Bio-informatics, neuro-informatics
12	Internet technologies	24	Others

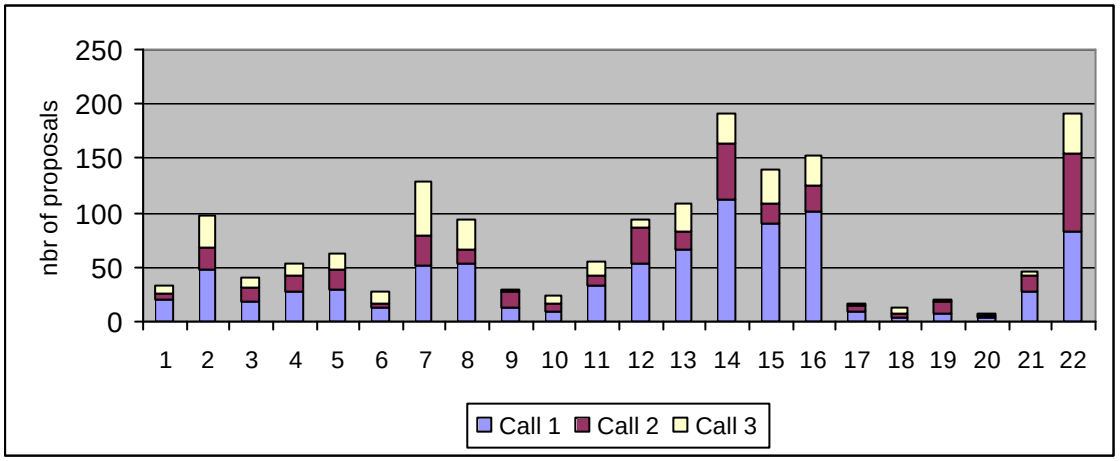
Fig. 1: Distribution of call 1, 2 and 3 by technology category

The technology areas addressed by more than a hundred projects are:

- *Knowledge and information management:* Several projects in the application oriented areas in KA1, 2 and 3 develop and/or use information retrieval, browsing and filtering engines as well as more elaborate knowledge management and collaborative working tools. Most of the target solutions are web- and internet-based and address the integration/application of these technologies in new areas and for new working methods and processes. This explains also the large proportion of projects addressing Internet technologies.
- *Internet technologies:* See above
- *Mobile and wireless communications:* In addition to KA4 projects addressing the core wireless and mobile technologies, including 4th generation, almost half of the projects in this category address mobile applications and services starting from existing second generation mobile applications and their evolution towards third generation as well as wireless home networking applications using industry standards such as Bluetooth. As indicated later in the report, the number of projects addressing third generation UMTS applications and services is less than expected but will probably grow after the next calls.
- *Micro and opto-electronics:* The majority of projects in this area are evenly spread between KA4 (design and production tools for pushing the limit of CMOS, other materials and opto-electronics and photonics) and FET (nano-scale and future generation components).

- *Micro-systems and sensors:* In addition to KA4 and FET work on the basic technologies for design and production of micro-systems, a large number of projects in KA1 in particular, address the integration of advanced sensor technologies into health, environment, transport and assistive systems.
- *Visualisation, virtual environments and image processing*: This is spread across the programme and addresses mainly virtual environments in terms of technologies (KA3 and KA4) and their applications in culture, education, collaborative work, health systems etc.

The distribution of the projects by targeted industry/service sector is shown below



1	Finance/insurance	12	Transport
2	Electronic publishing and media industry	13	Consumer electronics and home appliances
3	Cultural sector	14	I.T. manufacturing and service industry
4	Retail sector	15	Telecom equipment industry
5	Administrations	16	Telecom operators and service providers
6	Social services	17	Chemical industry
7	Healthcare	18	Textile and clothing industry
8	Education and training sector	19	Agriculture, agri-food and fishery
9	Tourism	20	Pharmaceuticals and genetics
10	Energy	21	Construction, engineering and architecture
11	Environment	22	Others

Fig. 2: Distribution call 1, 2 and 3 by targeted industry/service sector

The most frequently addressed sectors are:

- I.T. manufacturing and service industry
- Telecom operators and service providers
- Telecom equipment industry

A substantial number of projects address the following application sectors:

- Healthcare
- Electronic publishing and media
- Education and training

- Transport
- Consumer electronics and home appliances

Many projects address generic technologies and are of a cross-sectoral nature, which explains why many projects are in the 'others' category. The projects in all three calls address a wide range of technologies and industry/service sectors. There seems to be a balance between the coverage of generic technologies on the one hand and application oriented technologies on the other hand, which is in line with the programme's profile and structure of its KAs.

3.3 Suggested Cross Programme clusters

A IPPA3 working group identified possible Cross Programme clusters by using the following approach:

- Querying the database with key words related first to cross programme themes from the workprogramme (WP). The abstracts of projects found to match these key words were examined to determine the level of relevance (not applicable, low, medium or high). Queries were also made on key words related to topics which were thought to be of a cross programme nature by the experts (e.g. UMTS services and agent technologies).
- The groups of projects were then evaluated in terms of the extent to which they provided synergy (critical mass, distribution across programme) and balance (between applications and research).

After this analysis the following topics for clustering are suggested. The number of projects per cluster is indicative and should be further checked when setting up these clusters. Given the short time available for the IPPA exercise and the number of topics addressed, the experts can only suggest topics to be explored further by the IST-programme. It's recommended that an internal team from the programme further explores the topics suggested.

Agents Agent technologies are identified in approximately 60 projects and appear well covered, from both a technology and an application point of view. This includes projects dealing with collecting information (filtering, collaborative data mining), access to information (guided web access, high level directories) and human interactions (emotion, humanoids). The projects identified are well spread across the Key Actions.

Sensors Projects in the group cover the technology development (design, development and production) and their applications in several areas such as health, environment, transport and assistive systems. Nearly 60 projects were identified that are well spread over the Key Actions with a peak in KA1 and KA4.

Smart Cards Approximately 20 projects were identified across the different KAs, (technology, content and citizen). This possible cluster is worth exploring as a means of building critical mass.

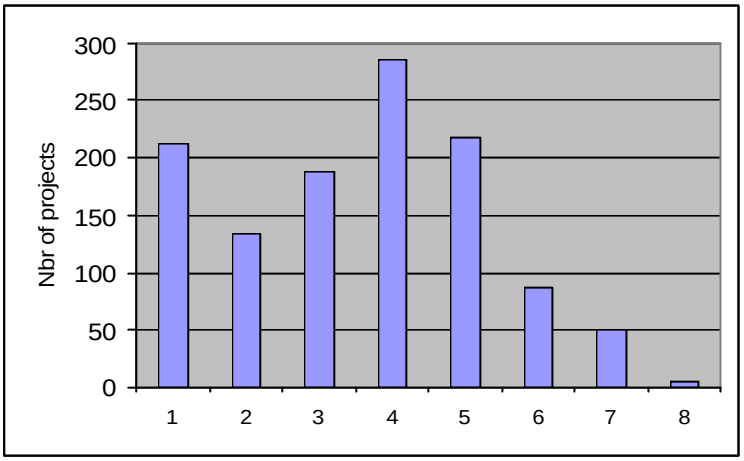
Displays Approximately 25 identified projects are spread over the KAs with a peak in KA4. They are primarily in the research phase but start to be used by other KAs, especially KA1. Further detailed exploration may be worthwhile.

The case of UMTS applications and services

An analysis was also done on projects dealing with mobile services in KA1, KA2 and KA3 in particular. Around 60 projects address mobile applications and services but approximately 10 of these only address third generation mobile UMTS applications, which is a smaller number of projects than one might expect.

3.4 Expected output of projects

The IPPA-team also analysed the expected output of the RTD-projects using the categories below:



1 New products
2 New services
3 Improved methodologies (e.g. business processes, software design processes etc)
4 Proof of concept (e.g. prototyping, feasibility research etc)
5 Progressing know-how/technologies
6 Standardisation
7 Technology components
8 Others

Fig. 3: Expected output of RTD projects call 1, 2 and 3

The analysis show that the largest category of expected output is about proof of concept including prototyping and feasibility research. It is often the case in industrial collaborative projects that industry conducts ground-breaking work exploring the validity/feasibility of new avenues and using the know how and capabilities of academic research centres. This enables industrial partners to share risk and to exploit individually the results at a later stage. Overall the programme expected output is balanced between the different categories. The "standards" output seems low.

4 Constituency analysis

After three calls the programme supports just over a thousand projects and nearly half of the total budget is allocated. An analysis of the constituency shows that (see also annex 4):

- Nearly half of the projects' participants come from industry.
- The largest category of participations is the SMEs (25%), followed by Large Enterprises (22%). In terms of funding the largest category is Large Enterprises (28%) followed by SMEs (23%).
- Large enterprises and SMEs co-operate with each other in 63% of the RTD-projects. Practically no SMEs are to be found in RTD-projects with a time to market beyond 10 years.
- KA4 attracts the highest proportion of large enterprises; KA4 accounts for about 40% of all participations by large enterprises.
- KA1 and KA2 together account for about half of all the participations by SMEs.
- The constituency of FET and RN differs from those of the KAs in the sense that mainly research centres and higher education establishments participate. However KA3 and the CPAs also attract a large proportion of higher education establishments.
- 7% of the total number of participations come from the associated countries (funding 5%), and 5% of the participations are from third countries and international organisations (Switzerland, US, Canada, Japan etc.) with a funding of 1%.

4.1 Consortium profile

The IST RTD-projects across all calls have the following profile (see also annex 4):

- Average number of participants per project: 7,5.
  About 70% of the projects have between 5-9 participants.
- Average funding per project: 1,8 mEuro.
  About two-thirds of the projects have a funding between 1-2,5 mEuro
- Most projects have durations of either 2 or 3 years.
  The average funding per participant/per project is 150.000 euro a year, which is the equivalent of 1,5 - 3 person years in terms of total effort.

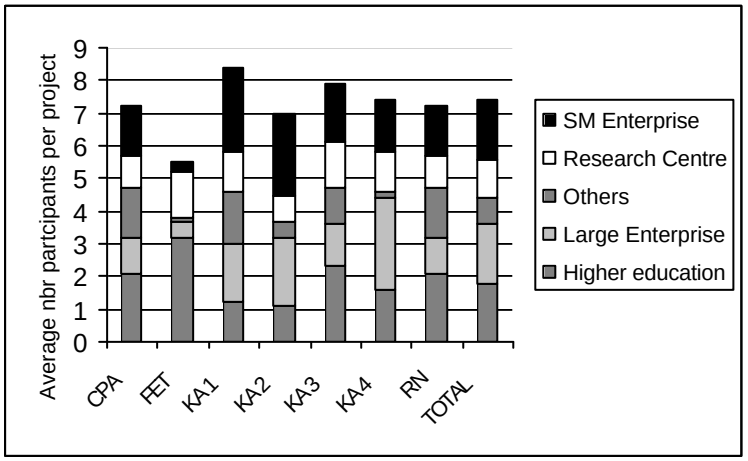


Fig. 4: Average number of participants per RTD project in call 1, 2 and 3

Figure 4 gives an overview of the average number of participants per project. It seems to indicate a tendency of proposers across the programme to set up consortia with a similar kind of profile, almost irrespective of the technological nature of the project. This may reflect a feeling on the part of proposers that, in order to take into account the different criteria (e.g. the technological, social economic, exploitation), one should work with a 'standard' consortium model.

The result is that the available funding per project partner is relatively small. Also project management issues as well as consensus building could be difficult with this relatively high average number of participants.

The IST-programme doesn't yet seem to stimulate different sizes of projects and structures. Consortia seem to be formed following a "standard" structure and budget irrespective of the type of activity and expected outcome (e.g. incremental shift, paradigm shift, developing new products or technological building blocks etc).

5 Support Measures

The IPPA report following call 2 had a special section on Take-up actions. This chapter in the present report provides an overall picture of the support measures in the first three calls.

The support measures run in parallel with the RTD, and are employed to prepare, support and facilitate the rapid adoption and subsequent transfer of technologies, experiences and know-how gained in the RTD activities. The support measures include e.g.:

– Accompanying measures (AM): studies, dissemination and awareness activities, training[5].
– Thematic Networks (TN): working groups and networks of excellence, aimed at bringing together researchers from industry and academia.

In calls 1, 2 and 3 there is a total of 127 support measures with a budget of about 133 mEuro (8% of total budget). 64% of the projects are AM (budget about 90 mEuro) and 36% of the projects are TN (budget about 44 mEuro).

Most support measures relate directly to research activities undertaken by the Key Actions, FET or RN; they are defined as action lines in the related sections of the workprogramme. Next to this there are the general support measure (GS) submitted under action line VIII in the workprogramme. The next table shows that KA2 and KA3 have relatively more support measures directly submitted under the Action Lines defined by the KAs.

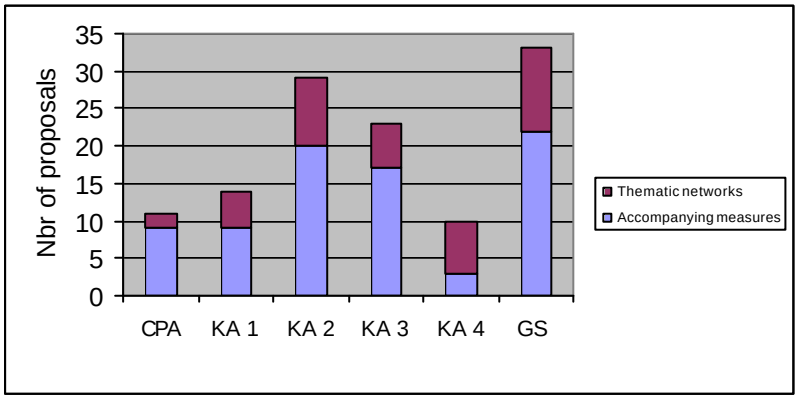


Fig 5: Distribution of support measures

Participants in the TN projects are predominantly from higher education establishments and research centres. For AM projects there is a more even distribution across the type of participants, with SMEs well represented. It is important to take account of the fact that for many support measures the participants are primarily organisers of activities (such as workshops and web sites) that are intended to be attended by people outside the project itself.

The orientation of the support measures can be described as either 'inward looking' or 'outward looking'. Inward looking projects support RTD projects already funded by the programme e.g.

[5] The training fellowships were excluded from the analysis because of their specific nature

cluster activities, whilst outward looking projects provide services to a wider community. The following table gives an overview of the orientation per call.

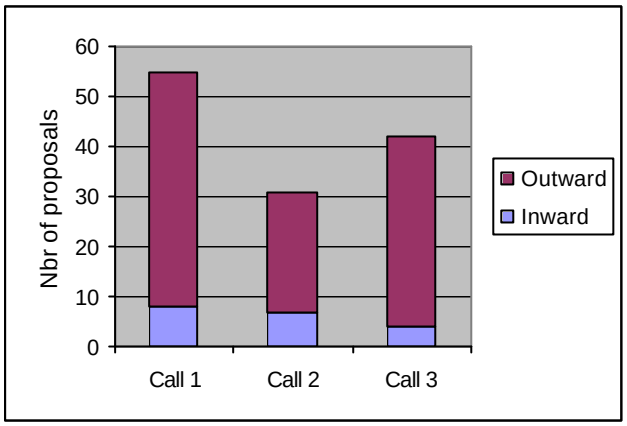


Fig.6: Orientation of support measures per call

The majority of the projects are outward looking measures. The proportion of inward looking projects was 15% for call 1, 22% for call 2 and 10% for call 3. Since projects aimed at supporting clusters would be expected to rise as the programme develops, the drop in the third call is surprising. Annex 5 gives an overview of the activities of the outward looking projects.

6 Time to market of portfolio of projects

When reading the 3rd call proposals, the IPPA3 team estimated the time-to-market of the results of the RTD projects, based on the reading of the full proposals. The time-scale was similar to that used in IPPA following call 2:

- Less than three years from the project start date.
- Three to five years from the start date.
- Five to ten years from the start date.
- More than ten years after the start date.

Again, the aim was to identify the main trends, rather then to give precise figures. The table below shows the results [6], for the 3rd call and the combined calls 1-3.

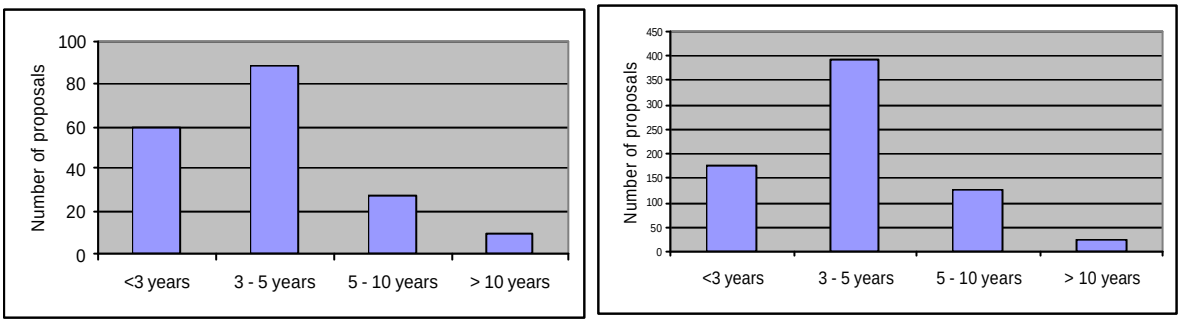


Fig. 7: Time to market for RTD projects, for call 3(left) and for call 1, 2 and 3 (right)

The results for combined calls 1-3 are:

- About 25% of the RTD projects are in the 3 year range
- About 54% of the RTD projects are in the 3-5 year range
- About 18% of the RTD projects are in the 5-10 year range
- Few RTD projects (3%) are in the >10 year range.

In comparison with the first two calls there is:

- An increase in the 3 years range: from 20% in call 1-2 to 32% in call 3.
- A decline in the 3-5 year range: from 57% in call 1-2 to 48% in call 3.
- A decline in the 5-10 range: from 20% in call 1-2 to15% in call 3
- A stable amount in >10 year range: 3%

ISTAG, the advisory group of the IST-programme has identified 10 Key Enabling Technologies (KETs) to enable the IST programme vision of "ambient intelligence" (for a further elaboration see chapter 8, annex 7). RTD projects in call 3, which are linked to KETs have a longer time to market: 19% of these projects fall in the 5-10 years range and 8% fall in the > 10 years range.

The increase in the 3 years' range in call 3 is partly due to the fact that KA2 and KA3 - which have relatively more projects in this time range - had many Action Lines open in this call. Also the CPAs

[6] Support measures and Take-Up actions were excluded, because by definition these are close to the market.

open in this call - CPA4 Large scale systems survivability, CPA5 Smart Cards, CPA7 Socio-Economic analysis and CPA8 Statistical tools, methods, indicators & applications – are relatively close to market.

The IPPA report following call 2 stated that there is a gap in supporting RTD with a 5 to 10 year horizon and that the programme needs to address the longer time perspective. The discussion following the IPPA2 report resulted in a stronger focus in WP 2001 on long-term/high risk projects. Call 3 however is based on WP 2000. As a result of call 3 the gap in supporting RTD with a 5 to 10 year horizon has been confirmed. An explanation could be that KA4 had only a few projects retained in this call because only two Action Lines were open.

As a pilot approach, to be further explored in next exercises, an analysis was done on the gap in the 5-10 year time-frame in the area of man-machine interactions and interfaces. The purpose was to understand what technologies and applications might be neglected if this gap is not addressed. The area was chosen because of its generic nature and its high impact on the programme vision. The detailed analysis is given in annex 10. It shows that for this particular area, the technology and application building blocks for the next five years are being developed in the programme, but their integration into medium-term concepts that bridge the gap with more visionary research in FET is only partially addressed.

7 Risk profile

7.1 Analysis of market opportunity windows

Drawing on the methodology set by IPPA following call 2, the IPPA3 team analysed the *risks related to market dynamics*. It identified the "market opportunity windows" i.e. the "time window" within which the relevant markets present opportunities. It then compared these opportunities with the estimated time it will take projects to deliver marketable products[7].

In estimating the market windows, the following factors were taken into account:

- Nature of the technology
- Maturity of the technology
- Market competition
- User acceptance
- Market characteristics and entry barriers

The rationale is the same as for the last IPPA analysis:

- Projects that fall within the market opportunity window have relatively low market risk (i.e. project results are delivered at a point when markets are ready to absorb them).
- Projects that have time to market outside the market opportunity window normally aim at the next generation of products and services. The degree of innovation is critical to the success of these projects. Simple incremental developments in technologies or applications are generally not enough. If innovative enough, such projects could be highly rewarding (high risk/high return) in terms of new high-value products and services.

The analysis was independent of the structure of the programme, e.g. projects addressing Public Services do not only come from KA1 and the same is true for projects in e-commerce (not only from KA2) or software (not only from KA4). The IPPA3 team made a separate analysis of FET projects.

The results of the consolidated analysis for calls 1, 2 and 3 are presented in figure 8. Annex 8 gives a separate overview for the risk profile of call 3.

[7] Take-Up actions and support measures were excluded as they are expected to address their respective markets almost immediately.

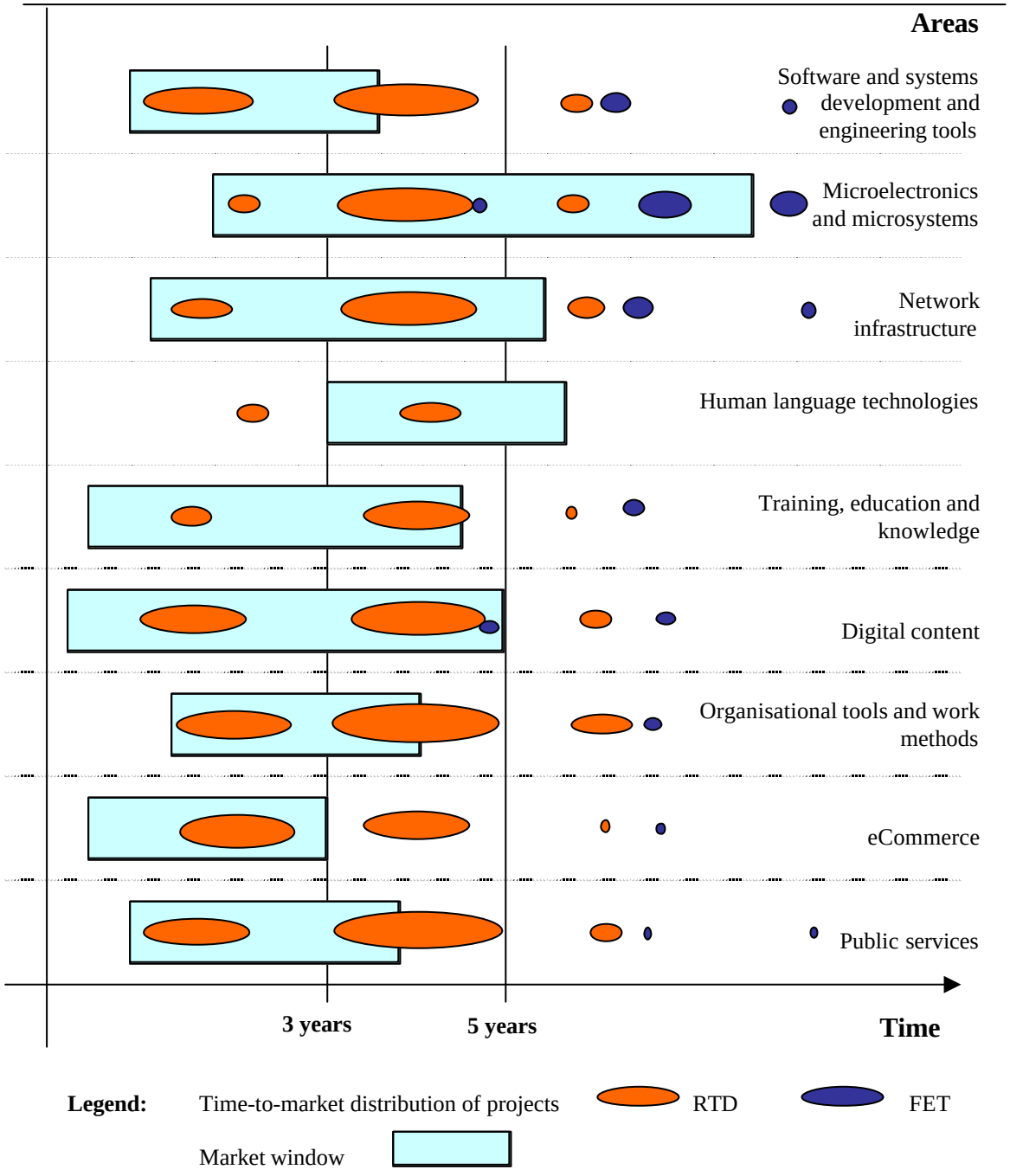


Fig. 8: Market Windows and projects' time-to-market' for Call 1, 2 and 3

Most observations still apply relating to market windows vs. time-to-market which were made in the IPPA following call 2. They are repeated here, complemented by some additional observations:

- *Software and systems development and engineering tools*: About half of the RTD projects are expected to deliver commercial products outside of the market window. This suggests that these projects have high market risk and should be carefully monitored in order to ensure high levels of innovations or more rapid delivery of marketable products.
- *Micro-electronics and micro-systems*: Most of the microelectronics projects have times to market that are consistent with the market windows. Microelectronics, unlike software, has high barriers to entry and developments tend to follow the expected roadmaps. There appears to be a good balance between RTD and FET projects.
- *Network infrastructure*: The long-term nature of the investments implies a fairly wide market opportunity window. Two thirds of the portfolio are comfortably within this window. The projects outside it seem to be addressing next generation technologies.
- *Human Language Technologies:* Projects are in line with market opportunity window. Some of the applications (i.e. speech applications) could be enhanced by adding speech recognition to standard personal computing equipment and mobile phones/PDAs. A set of projects would appear to be ahead of the market, probably because their integration into existing applications poses problems.
- *Training, education and knowledge:* Apart from the FET projects most projects are in line with the market opportunity window.
- *Digital Content:* The majority of the projects are in line with the market opportunity window.
- *Organisational tools and work methods*: About half of the projects are in line with the market opportunity window. However some fall outside and it is important that these address the next generation of methods and tools.
- *E-commerce* is a fast-moving but unpredictable area because technology and applications are evolving rapidly. Most IST projects will not deliver marketable products until after 2002~2003; which may be too late, unless they can offer very innovative approaches in terms of technology, applications or solutions that can be integrated within different paradigms (e.g., mobile solutions). Only 10 proposals selected in the 3rd call address more or less directly e-commerce. All proposals linked to this sector have the same time-to-market profile as in the previous calls. Most proposals falling outside the market window have an average to high market risk.
- *Public services*: The area is developing at a slower pace than e-Commerce. Almost half of the projects fall outside the market window. Most projects are clearly addressing innovative solutions (e.g. in transport or health). This area has a large number of projects in the 3rd call. Most projects falling outside the market window have an average to high market risk.
- The current report analysed the FET projects separately. FET projects seem to be well placed on the time scale, complementing the other RTD projects but obviously taking a longer time perspective. However, their relative shares in the respective areas vary strongly. Very few FET projects address the areas of Human Language Technologies, of Training, education and knowledge and of eCommerce.

7.2 Evolutionary and paradigm shifts

Another approach to analyse the portfolio of projects is to consider the extent to which projects will enable 'evolutionary' or 'paradigm' shifts to take place. The methodology developed by the IPPA3 team requires further refinement. Overall, however, the team found this broad distinction helpful.

Both evolutionary shifts and paradigm shift can take place in technologies and in the application of these technologies, and thus the following four categories can be distinguished:

1. Paradigm shifts in new technologies
Such projects typically focus on a paradigm shift in systems design or functionality or on the development of new concepts to solve technical problems. These projects often have a high technical risk and address a market which is expected to develop beyond five, and sometimes ten years. Such projects can be expected to develop the technology needed for the next paradigm shift in applications and working processes with a prospective rollout beyond 2006.

Examples of paradigm shifts include the move to: intelligent assistants, based on agent technology; tangible media and intelligent fabrics and context aware applications. Many projects of these types are to be found in FET and some are to be found in KA4. However the expected paradigm shift due to the widespread use of wireless networks to interconnect devices and as an access network to the Internet are, as yet, not well reflected, in the programme projects.

2. Evolutionary shifts in technology
Some projects in KA4 aim to implement already defined standards, or to integrate different types of existing technology into systems with a broader functionality than the current systems. They often have medium technology and market risk and a time to market of three to five years.

3. Paradigm shifts by re-engineering processes
Several projects in KA1, KA2 and KA3 aim at paradigm shifts in the re-engineering of processes, driven by the advent of Internet and World Wide Web technologies. In order to be able to introduce reliable, tested technology in application sectors, these projects need to focus on identifying the problems and making modifications to the working processes enabled by these new technologies. From a technological perspective, these projects mostly aim at incremental improvements in terms of system design and functionality. The risk in terms of market acceptance and take-up, however, is often high. The technologies that these projects plan to introduce to their sector will be in widespread use within three to five years. The market emerging in application sectors beyond this time window will be based on new technology paradigms, beyond the use of first generation World Wide Web technology and Internet technology.

Examples of such paradigm shifts include projects addressing the redesigning of learning processes or the re-engineering of agricultural processes.

4. Evolutionary shifts by moderate changes in working processes
Some application projects in Key Action 1,2 and 3 aim to make moderate changes to working processes as they introduce Internet and World Wide Web technology to a sector. In comparison to those projects aiming to completely re-engineer processes, they have a lower market and user acceptance risk.

7.3 *Analysis of technological challenge vs. market size*

The risk analysis in paragraph 7.1 is based on the time-windows of predictable market opportunities. Technical risk can be also independent of time, i.e. projects might have a short to medium time to market but a high technical risk. This is why a time-independent risk analysis was tried for RTD-projects in call 3.

The following methodology was used. The level of technical risk - defined as the level of technical transformation a project is aiming at – was mapped to the potential size of the target market. Based on a reading of the full proposal, experts estimated the extent to which projects faced evolutionary, medium or paradigm shifts in technologies or services developed and offered low, medium or high market potential[8]. Values for individual projects were derived from counting the occurrences of the 9 possible combinations between low/medium/high market potential and low/medium/high technical challenge. The results of the analysis are presented below .[9]

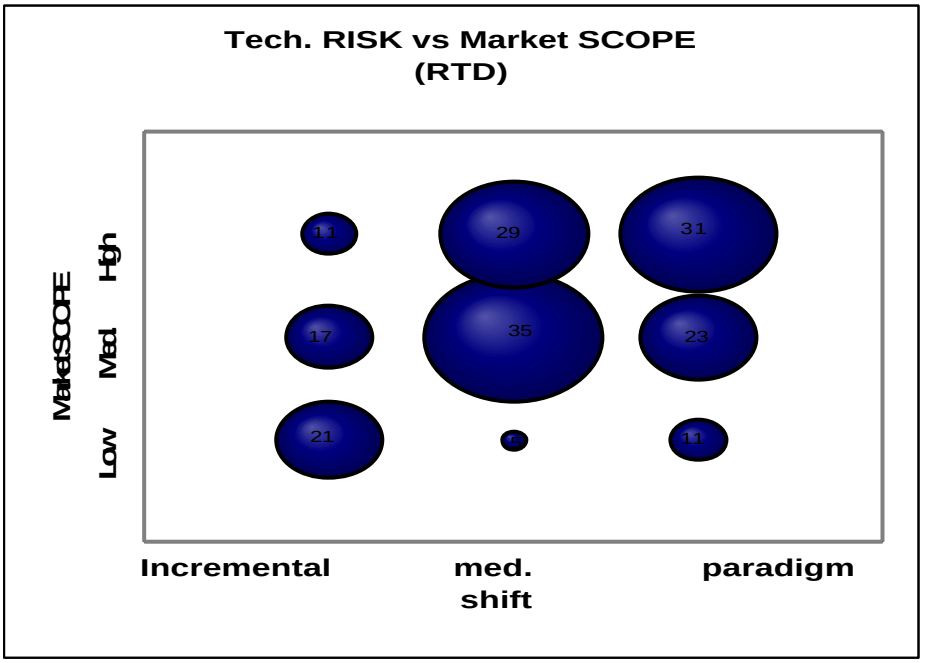


Fig. 9: Technological challenges versus the potential size of the target market addressed

The majority of projects (63%) have medium to high values for technical challenges/market potential. This is not surprising - a medium to high technical challenge can be expected of selected projects that have exceeded the evaluation threshold set for scientific/technological quality and innovation. It is also probably fair to assume that most selected projects are looking for a medium to high market return. The above analysis, however, allows us to test these assumptions for the first time.

[8] See Annex 8 for a description of the methodology used.

[9] It should be noted that the type of chart used (bubbles with the resulting data values taken as the diameter of the bubble) tends to visually increase the perception of the difference between small and large spheres. Thus size of the spheres have to be interpreted as a tendency and not as an absolute value.

In the third call 18% of the projects match the 'high-risk/high-results' profile recommended by ISTAG. The analysis can also, of course, be used to identify projects with a low technological challenge and high market potential that may represent the 'ideal' investment for a venture capitalist but are not necessarily the sort of projects that research programmes supported by public funds should be seeking to attract.

Given the limited time available for the IPPA3 exercise, it has not been possible to test and refine the methodology used in this risk analysis and some degree of caution is advised with regard to interpreting the initial results. Experts in a following IPPA exercise may wish to try to validate these initial findings and apply the methodology to projects classified e.g. by Key Actions or by KETs.

7.4 Socio-economic analysis and adoption potential

A model for socio-economic analysis

An analysis was done, in the IPPA exercise, on how the social-economic objectives of the programme are addressed in the RTD projects of Call 3 with a particular emphasis on the expected cost-benefits to the end user.

A simplified model of the technology development process was used as a basis for the cost-benefit analysis (see figure 10). The model defines five critical success factors for the development of user-friendly technology: social benefit, usability, technical viability, feasibility, exploitability.

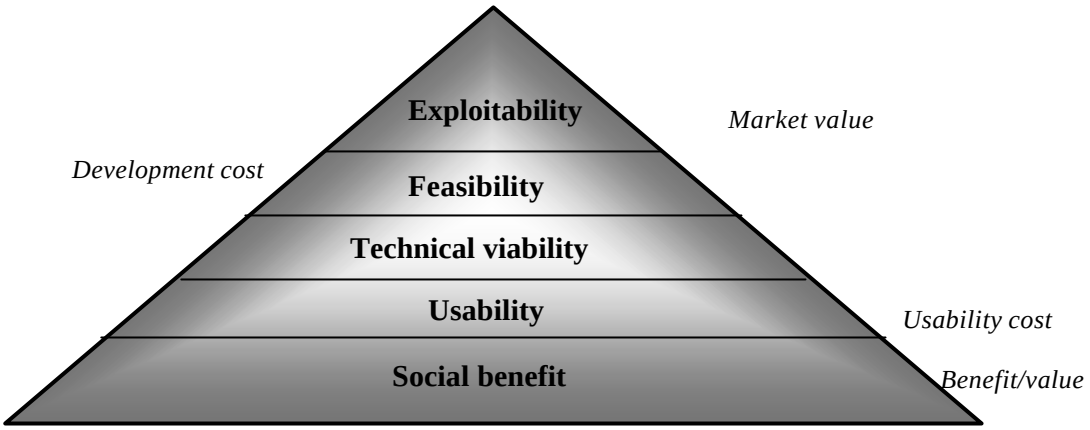


Fig. 10:Basic cost-benefit model of new technology development and delivery

- **Social benefit** – ***What is the benefit to the end user ?*** Measures the value of a new technology in terms of its usefulness to an end user or group of users in their everyday life.
- **Usability** – ***What is needed to make the technology user-friendly?*** Measures the effort required by a user or group of users to be able to use a given technology.
- **Technical viability** – ***What technological opportunities make the project valid?*** Are new component technologies, infrastructures and methods available to implement the idea.
- **Feasibility** – ***Can the technology « good » be developed?*** Measures how feasible it is to build the technology « good » .
- **Exploitability** – ***Can it be sold?*** What is the market value and competition for the technology, product, service. This depends upon the added value it offers to the user (c.f social benefit) and the cost the user is must make to acquire the benefit (cf. usability).

It is valid to enter the pyramid from the top, with market knowledge, from the bottom with knowledge of what will be valuable to users or from the middle, with a new technical concept. In

doing so, it is critical to work both up and down and perform development activities in all parts of the pyramid.

The model provides a framework for gaining a better understanding of how IST projects address important issues ranging from social benefit through to exploitability. As a general observation, when entering in the middle, failure to work in both directions can result in poor exploitation and possibly lack of user benefits or poor levels of usability.

Adoption risks

A methodology was used within this IPPA exercise to identify how the portfolio of IST projects would map into the above model and mainly to the lower layers related to social benefits. The higher layers are addressed in previous paragraphs. The methodology requires further refinement and was done as a tentative analysis for call 3 projects only. Experts have tried to classify these projects according to their potential social benefit and to the degree of social transformations that the exploitation of their results would require (usability costs). The chart below correlates these two dimensions and provides, as such, a view on the social adoption risks of these projects.

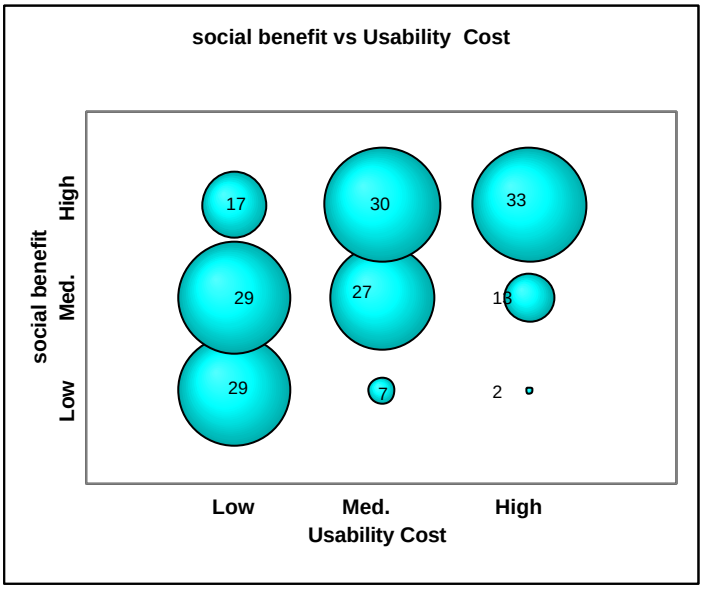


Fig. 11:Social benefit versus usability cost

Usability Costs

Low: e.g. none or small incremental changes needed to the way people do things at present, none or small changes to organisational structures, way of working, small educational or cultural changes needed.

Medium challenging but feasible changes needed in society.

High: significant changes needed in society.

Social benefit

Low : e.g. none or limited contribution to social challenges, solving only small problems or offering only small new capabilities for the user, organisation, family, society, a low contribution to improving quality of life, equal opportunities, employment, safety, protection and social inclusion.

Medium: e.g. solving real but not crucial problems, offering moderately useful new capabilities for the user, organisation, family, etc.

High : e.g. addressing significant or crucial social challenges for the user, organisation, family etc, allowing people to do things not possible before or allowing people to do things they do presently in a much improved way, clearly enhancing social inclusion.

Figure 11 shows that about 55% of the 3rd call RTD projects have medium to high social benefit corresponding to medium to high usability costs. If successful, these projects have the potential to foster greater levels of socio-economic transformation. A further 24% of projects have medium to high usability costs with a low social benefit. Less than 5% of projects have high social benefit, combined with low adaptation risks, which is to be expected.

Socio-economic projects in call 3

CPA7 on socio-economic analyses for the information society is, as is indicated by the title, devoted to socio-economic aspects across the programme. The 9 projects proposed for funding address issues such as social inclusion, women and IST, the uptake and usage of information society technologies, and socio-economic modeling. A total of 16 projects in call 3 address specific socio-economic issues (see also annex 8), with a total funding of about 22 mEuro, which represents about 5 % of the budget for call 3. This is an increase in comparison with call 2.

Type of users involved

End-user involvement is an important aspect of the model. Timely involvement of 'appropriate' end-users will, generally, improve the probability of a given project delivering high social benefit coupled with minimised usability costs. This is especially true for the application-oriented areas.

An analysis of the users targeted showed that an estimated 43% of the RTD-projects are aimed at professional users, 26% is aimed at special requirements groups (e.g. institutions/organisations addressing elderly, disabled, ill people, people with low education levels, prisoners, etc.) and about 30% of the projects are aimed at the general public.

8 Linking the Portfolio to the Programme Vision

ISTAG was set up to provide the Commission with independent advice on the content and direction of the IST programme. As part of this work it developed a vision for the programme, namely that it should develop an environment where a citizen's everyday surroundings become the interface to IST resources. This idea has been elaborated into a vision statement:

> *'Start creating the ambient intelligence landscape for seamless delivery of services and applications in Europe relying also upon test-beds and open source software, develop user friendliness and develop and converge the networking infrastructure in Europe to world class.'*

The vision has had a major influence on the development of Workprogramme 2000. As a further step ISTAG has identified ten Key Enabling Technologies (KETs) needed to realise the vision. These KETs influenced the Workprogramme 2001:

1. Embedded intelligence
2. Middle-ware and distributed systems
3. IP mobile and wireless
4. Multi-domain network management
5. Converging core and access networks
6. Micro- and opto-electronics
7. Trust and confidence
8. Cross media content
9. Multi-modal and adaptive interfaces
10. Multilingual dialogue mode

A definition of each of these KETs is given in Annex 6.

8.1 Linking the programme portfolio to the KETs

Call 3 is the first call which is based on the Workprogramme 2000. To estimate the alignment of the portfolio with the vision, the IPPA team examined in how far the projects make a significant contribution to one or more KETs (strict mapping).[10] It was found that 70% of the RTD projects in call 3 contribute significantly to the vision, against 40% of the RTD-projects in call 1 and 60% in call 2.

[10]Experts were asked to estimate the contribution of each proposal to 1 or at most 2 KETs.
In the IPPA following call 2 the experts also examined how far the proposals were relevant to one of the KETs (relaxed mapping) because call 1 and 2 were based on the 1999 Workprogramme, which predated the IST vision.

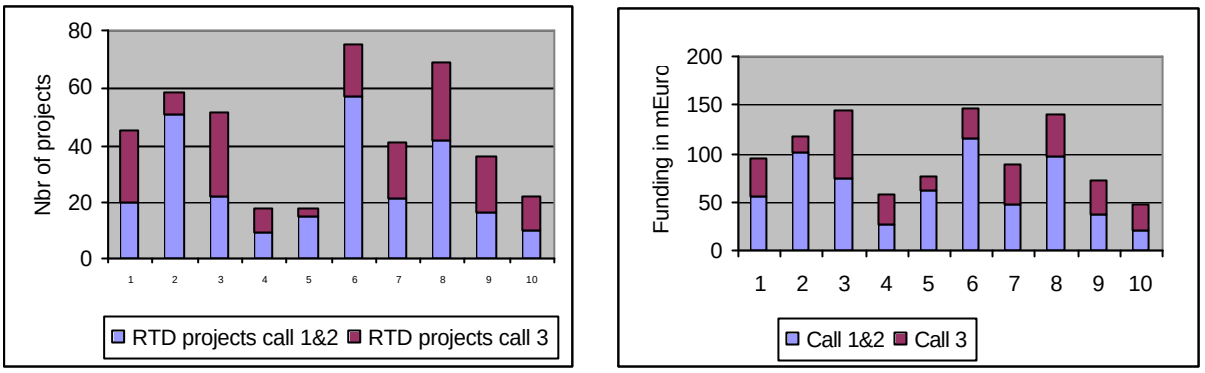


Fig. 12:Linking to the KETS in call 1,2 and 3; number of RTD projects and funding

The contribution to Embedded Intelligence (KET1), IP mobile and wireless (KET3), Trust and confidence (KET7), Cross media content (KET8) and Multi-modal and adaptive interfaces (KET9) has almost doubled in call 3. This reflects the change in the focus of the programme.

The contribution to Multi-domain network management (KET4) and Converging core and access networks (KET 5) remains low which is according to expectations since KA4, which typically contributes to these KETs, had almost no action line open on relevant areas in call 3. The same applies to Middle-ware and distributed systems (KET2) which is well covered in terms of general technology category (chapter 3) but not in the context of the ambient intelligence landscape where the key challenge is in the distribution of applications between multiple embedded devices and heterogeneous servers.

KET1, 3, 6, 7, and 9 have been identified by ISTAG as being particularly appropriate for re-balancing towards longer time-to-market, specifically addressing 5-10 years time-to-market. In call 3 the time to market of projects related to Embedded intelligence (KET1), Micro- and opto-electronics (KET6) and Multi-modal and adaptive interfaces (KET9) have a time to market which is longer term than the average call 3 projects. These KETs contribute to the 5-10 year timeframe. See also annex 7.

Overall it seems to be encouraging that the focus of the IST programme on the vision has increased since this vision was introduced in WP 2000.

8.2 General observations

Looking at the KETs in the context of the many innovative research topics proposed in FET projects, one realises - what in many ways was obvious - that it will be necessary to expand the scope of the vision over time. This is in particular true for KET9 (Multi-modal and adaptive interfaces) and KET10 (Multi-lingual dialogue mode) which cover a wide range of important future technologies. For comments on some of the specific technologies see also annex 9.

9 Strengths, Weaknesses, Opportunities and Threats

Strengths	*Weaknesses*
1. The programme addresses a broad range of activities including the development of core technologies and applications. The target outcome is well balanced between proof of concepts, prototyping, new products and services as well as innovative methodologies and technology know how. 2. A significant proportion of the projects in call 3 focus on paradigm shifts in processes and practices and many of them address several application sectors. 3. A first analysis of call 3 shows that the majority of the projects have medium to high values for technical challenges/market potential. About 1 in 5 projects match the 'high-risk, high-impact' profile. 4. There is a good variety of highly innovative projects in FET, aiming at paradigm shifts in information processing technologies and learning (School of tomorrow), rather than incremental technology evolution. 5. Critical mass continue to build up in areas such as mobile and wireless communications and systems, sensors and embedded technologies, agent technologies and multi-modal interfaces. 6. In call 3 the link to the vision has been strengthened, which reflects the change in focus in the programme.	1. The 5-10 year "time gap" has again been confirmed in call 3, which could be partly due to KA4 being nearly absent. In particular, this could result in a lack of European strength in technologies required for the introduction of technologies beyond basic Internet and World Wide Web services in the timeframe beyond 2005. 2. Consortia seem to be formed following a "standard" structure and budget for any type of activity and any type of outcome. The programme does not seem to allow yet for different sizes of projects and structures to emerge. 3. Anticipated clustering of projects within IST appears to be less than expected. Opportunities are presented for cross programme clustering. Fewer projects were found to address third generation mobile UMTS applications than could be expected.

The following section summarises some of the major changes in the world in the year 2000, external to the IST Programme, which may have an impact on the future management and impact of the Programme.

Opportunities	*Threats*
1. Alternatives to the PC for accessing the internet are starting to emerge, in particular through mobile and wireless devices, consumer electronics, and devices embedded in commonplace appliances. This provides new technology and market opportunities in areas where Europe has demonstrated strength. 2. The industry for wireless and mobile devices has revised its projections on Internet access. By 2003 there will be more wireless and mobile devices that can access the Internet than PCs (an earlier projection was for this to happen in 2005). As Europe continues to be strong in wireless technology, the opportunity is presented to new and existing IST projects to address the growing market for wireless applications. 3. Many mobile network operators have placed a very high value on UMTS licenses (3rd Generation Mobile) during 2000. The opportunity is presented to the IST Programme to organise clustering of projects addressing mobile applications and to start new projects addressing applications for UMTS networks in coming years. 4. Many of the research themes of the FET projects will reach the market and mainstream research and development much sooner than anticipated one or two years ago (e.g. agents, virtual reality, interactive media). This offers the IST Programme the opportunity to build on work done in FET and increase the proportion of resources devoted to these themes thus strengthening the European position in these emerging industries.	1. Some market windows opened-up and will close earlier than expected due to the downturn of the net economy during the year 2000. As a consequence, some projects may have unexpected difficulty raising the venture capital needed to commercially exploit their results as products. 2. Anticipated ICT skills' shortages are becoming critical as time-to-market and product development life cycles shorten. Increased national funding of ICT research leaves many new and vacant research posts unfilled.

10 Annexes

Annex 1: Members of IPPA3 Team

Name	Function	Company
Jim Ayre	Partner	Multimedia Ventures
Alberto Bonetti	Head of Strategic Development	ASM BRESCIA SPA
Jak Boumans	Senior Consultant	Electronic Media Reporting
Karsten Decker	Director	Decker Consulting
Paul Devoldere	Managing Director	HYPHEN bvba
Alain Filée	Product Line Manager	Bull SA
Vasco Lagarto	Director	Portugal Telecom / Centro de Estudos de Telecomunicações
Annie Luciani	Research Engineer	ACROE Laboratory – INPG
José Pardo	Professor	Universidad Politécnica de Madrid
Mike Parr	Director	SAQ Systems Ltd.
Heikki Pentikäinen	R&D Manager	Nokia Research Centre
António Sousa Pereira	Professor	Universidade de Aveiro
Michel Saule	Projects Manager	STERIA
Henk Schepers	Group Manager	Philips Consumer Electronics
Günter Schumacher	R & D Manager	Forschungs Zentrum Informatik (FZI)
Carmel Smith	Usability Research Consultant	Usermatics Ltd
Geoffrey Stephenson	Managing Director	Knowledge Exchange Technologies Ltd.
Dimitris Tsoukalas	Research Director	National Centre for Scientific Research
Fiona Williams	Research Department Manager	Ericsson Eurolab Deutschland GmbH

Annex 2: IPPA Technology categories

1. *Software engineering*
   - Development processes (e.g. Component based development, etc.)
   - Programming languages, etc.

2. *Middle-ware and distributed systems*
   - Multi-layered and distributed architectures
   - Distributed operating systems
   - Distributed database systems and data warehousing
   - Applications inter-working, interoperability and integration tools

3. *Dependable systems and infrastructures*
   – Formal verification techniques, dependable software
   – Fault tolerance, prevention and prediction
   – Dependable networking infrastructures

4. *Knowledge and information management*
   - Knowledge representation, ontologies
   - Information retrieval and filtering including semantic-based information retrieval
   - Media indexing and filtering
   - Groupware and knowledge sharing

5. *Agent technologies*
   - Intelligent agents
   - Mobile agents

6. *Optimisation tools and decision support systems*
   - Data-mining and data exploration
   - Optimisation tools and decision support systems

7. *Content authoring tools*
   - Electronic authoring and publishing tools
   - Personalised content
   - Cross media content creation and delivery

8. *Trust and security*
   - Authentication, cryptography
   - Privacy enhancing technologies
   - Rights management
   - Smart Card technologies
   - Secure payment systems

9. *Supply chain management and generic organisational tools*
   – Enterprise application integration tools
   – ERP's, MRPs

10. *Simulation and CAD/CAM*
    - Simulation techniques and platforms
    - Computer Assisted Design and Manufacturing

11. *Embedded systems*
- Networked embedded systems architectures
- Programming languages for real time systems
- Networked sensors technologies

12. Internet technologies
- IP protocols and architectures including IPV6, Mobile IP

13. *Network management*
- Dynamic optimisation of network resources
- Network integration, Quality of service in a multi-domain context.
- Active networks management and self-reconfiguring networks
- Multi-domain network management

14. *Mobile and wireless communications*
- Third and fourth generation Mobile (UMTS, 4G)
- Interactive Broadcasting on WLC technologies
- Satellite communication technologies
- Antennas
- Re-configurable radio systems and networks
- Mobile devices and terminals

15. Switching, routing and communication systems
- Switching technologies and architectures
- Routing algorithms, techniques and architectures
- Communication techniques
- Optical networks

16. Computing architectures
- Systems architecture and algorithms
- Storage devices and peripherals

17. Micro- and opto-electronics:
- Microelectronics and opto-electronics design
- Microelectronics and opto-electronics manufacturing processes
- Nano-devices
- Intellectual Property blocks- Systems-on-a-chip (SOC)

18. Micro-systems and sensors
- Microsystems materials, packaging and interconnect
- Microsystems design tools
- Sensors
- Nano systems

19. Signal and data processing and conditioning
- DSP
- Data Compression and representation, MPEG

20. Multi-modal multi-sensorial interfaces:

- Multiple modalities, including language, gestures, haptic contacts, emotions, augmented, synthetic and virtual reality.
- Personalisation and intuitiveness of interfaces
- Displays technology

21. Language and speech technologies:
- Speech recognition
- Multi-lingual dialogue modes
- Cross-lingual information retrieval and categorisation

22. Visualisation, virtual environments and image processing
- Computer vision (e.g. sensors, actuators)
- Computer graphics
- Visualisation tools
- Virtual and augmented reality

23. *Bio-informatics, neuro-informatics*

24. Others

Annex 3: IPPA Industry and service sectors

1. *Finance/insurance*
   - *e*Banking systems
   - Insurance services
   - Specific organisational tools
   - Payment systems, smart cards, security

2. *Electronic publishing and media industry*
   - Authoring tools
   - Games and entertainment
   - Advertising

3. *Cultural sector*
   - Cultural heritage
   - Memory organisations
   - Digital libraries and collections

4. *Retail sector*
   - *e*Commerce transactions, B2C
   - Retail organisational and supply management tools, B2B,

5. *Administrations*
   - Administrative organisational tools
   - Public administration
   - *e*Democracy
   - Crime prevention

6. *Social services*
   - Public Welfare institutions, social security organisations etc

7. *Healthcare*
   - Medical equipment
   - Assistive systems (e.g. for disabled and elderly)
   - *e*Health services for patients and professionals

8. *Education and training sector*
   - Education systems, computer based training
   - Professional learning and training tools,

9. *Tourism*
   - Transactions, organisational tools and information systems

10. *Energy*
    - Simulation and visualisation tools
    - Manufacturing and organisational tools
    - Sensors and controls systems

11. *Environment*
    - Simulation and visualisation tools
    - Manufacturing and organisational tools

- Sensors and controls systems

12. *Transport*
    - Transport infrastructure (Safety, traffic control, scheduling, etc)
    - Transport industry:
        - Aerospace: design tools, simulation, control systems
        - Automotive: design tools, simulation, intelligent vehicles
        - Trains, ships, …: design tools, simulation, control systems

13. *Consumer electronics and home appliances*
    - Components, software and systems for consumer electronics equipment and home appliances
    - Specific organisational and production tools

14. *Information technology manufacturing and service industry*
    - Components, software tools and sub-systems for generic IT equipment and software packages
    - Specific organisational and production tools

15. *Telecom equipment industry*
    - Components, software tools and sub-systems for generic telecom equipment and networks
    - Specific organisational and production tools

16. *Telecom operators and service providers*
    - Service development and network management tools
    - Internet service providers, Mobile Service providers
    - Specific organisational tools

17. *Chemical industry*
    - Simulation and visualisation tools
    - Manufacturing and organisational tools

18. *Textile and clothing industry*
    - Simulation and visualisation tools
    - Manufacturing and organisational tools

19. *Agriculture, agri-food and fishery*
    - Information systems
    - Design tools, simulation, control systems

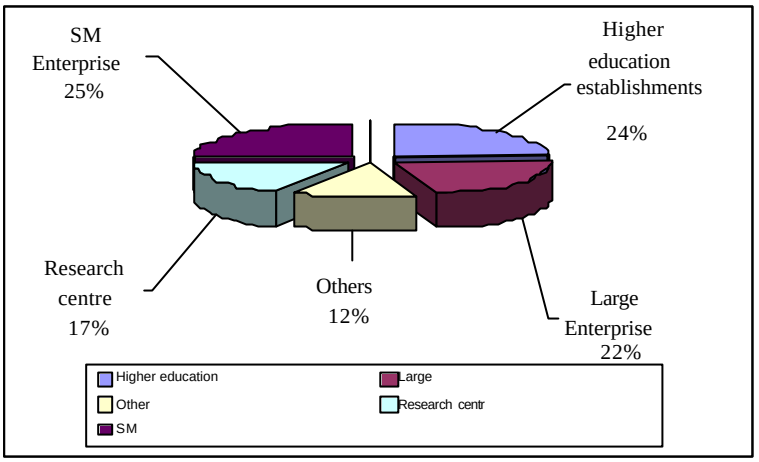
20. *Pharmaceuticals and genetics*
    - Simulation, visualisation and information management

21. *Construction, engineering and architecture*
    - Design tools, specific organisational tools

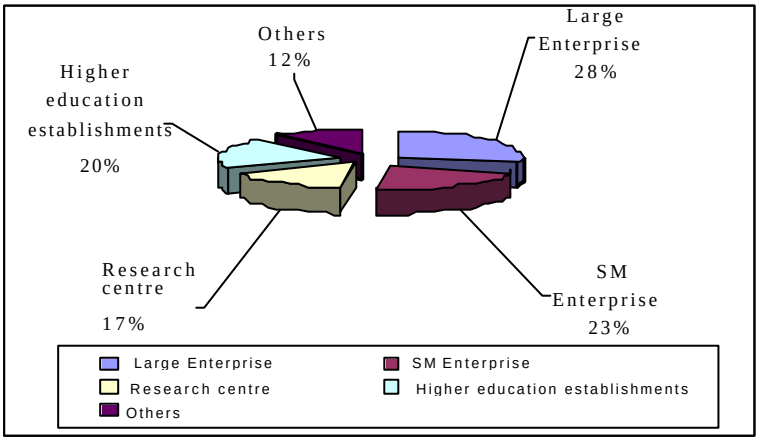
22. *Others*

Annex 4: Constituency

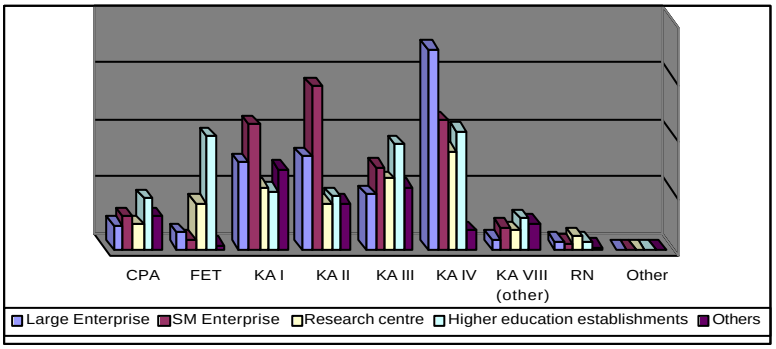
- *Distribution of participating organisations by organisation type, call 1, 2 and 3.*



- *Distribution of funding by organisation type, call 1, 2 and 3.*

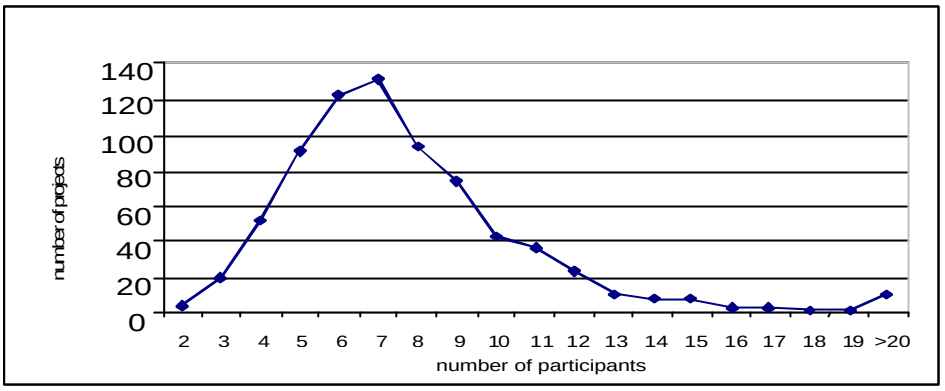


- *Distribution of participating organisations by Key Actions, call 1, 2 and 3.*

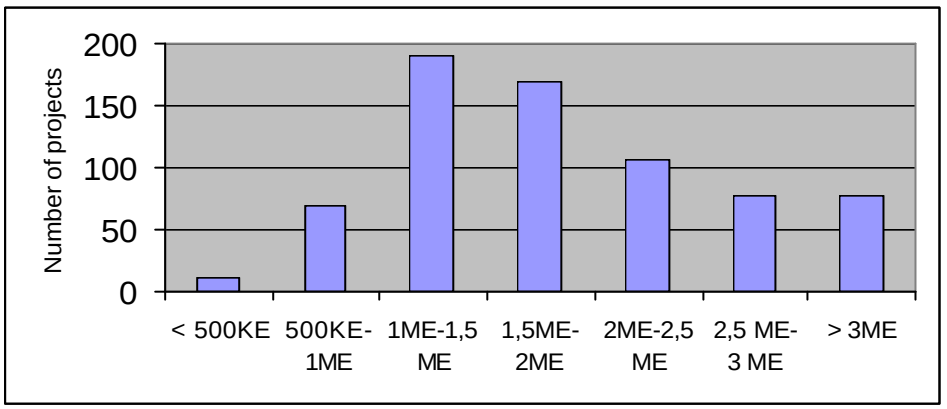


Consortium profile

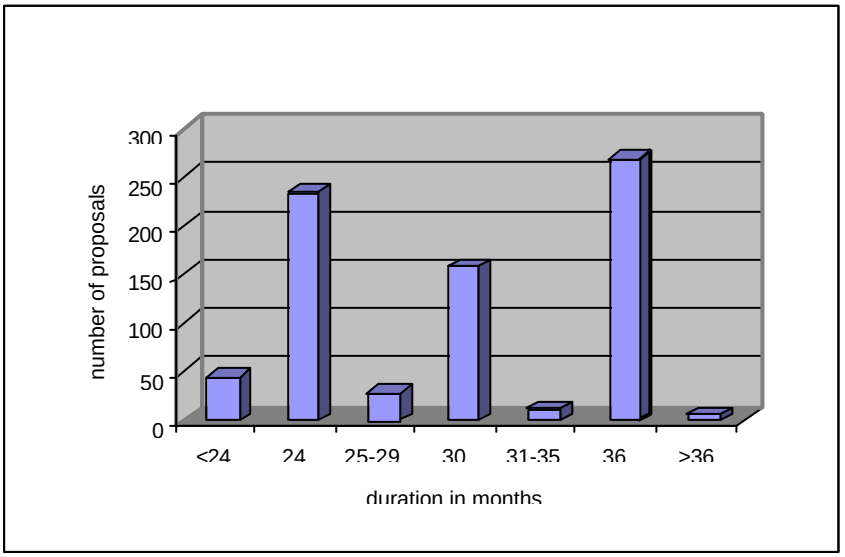
- *Number of participants per RTD project, call 1, 2 and 3.*



- *RTD projects funding curve, call 1, 2 and 3.*



- *Duration of RTD projects, call 1, 2 and 3*

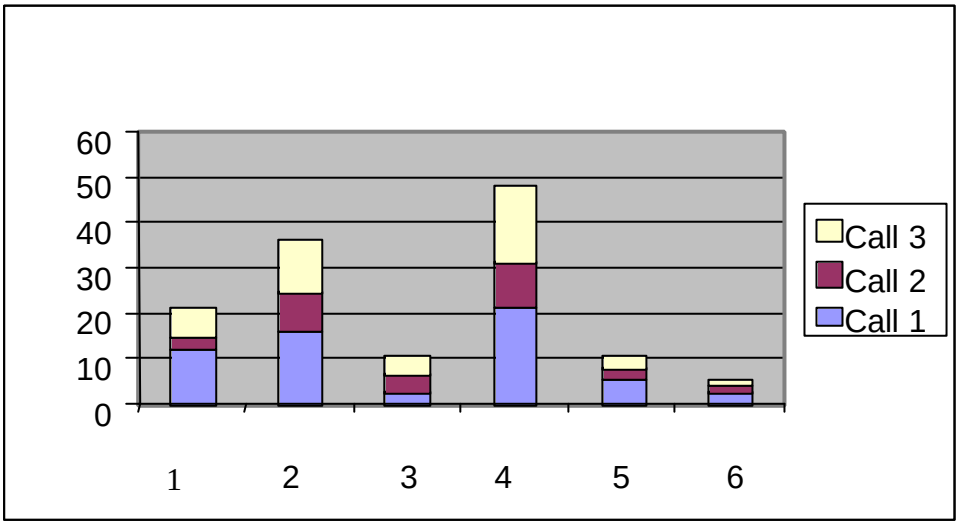


Annex 5: Support measures

The support measures can be described as either "inward looking" or "outward looking" (see chapter 5). For the outward looking projects an analysis was made of their activities, using the following classification:

1. *Technology transfer*: transfer of technologies developed by offering expertise, knowledge etc. For example: a project that aims at advancing the principles of universal access in the Information Society by addressing specific technologies and critical application domains through the establishment of a working group.
2. *Market focus*: expand market awareness, understand market needs, exchange usability practices, etc. For example a project that organises an incubator in the US for European RTD participants aiming to exploit the results of their projects.
3. *Social focus*: explore social aspects, identify social needs and impacts. For example a project exploring the impact of IST on families.
4. *Industry co-operation:* industry for a to exchange technical requirements, standardisation, interoperability etc. For example, a project that aims at EU-US on human language technologies standards.
5. *Training actions:* for example, a project aimed at training in micro-systems, sub-systems and IC's.
6. *Others*.

- *Orientations of outward looking support measures, call 1, 2 and 3.*



The main activities are industrial co-operation, technology transfer and market focus. Dissemination and awareness activities can be found in each of these groups. The result is in line with the intentions expressed in the work programme.

Annex 6: Key Enabling Technologies

KET 1: Embedded intelligence: Development and deployment of networked embedded systems (and software) in common-place appliances (fixed and mobile) to improve comfort, safety, and functionality of applications at home, at work, on the move, in leisure etc.

KET 2: Middle-ware and distributed systems: Multi-layered architectures to enable interoperability, inter-working, openness and integration of applications and services across platforms. This includes Java and Corba like architectures and component based software development. Also included are the technologies and methodologies that enable businesses to deploy agile and integrated processes that cut across companies and organisations in support of the development of new value chains.

KET 3: IP mobile and wireless: IP technologies that underpin the development of the ambient intelligence landscape including mobile and wireless internet technologies, the evolution of IPv6 and future generation of nomadic IP solutions in areas such as mobile e-commerce, e-work etc.

KET 4: Multi-domain network management: Dynamic optimisation of network resources and network integration to assure service transparency and quality of service in a multi-domain context. This includes as well active networks management and self-reconfiguring networks and distributed network management approaches in the context of increasing numbers of interconnected appliances that are wireless, fixed or mobile.

KET 5: Converging core and access networks: Integration, inter-working and interoperability of networking infrastructure including both access and core networks (fixed, mobile and wireless) as well as technologies for integrated broadband networks.

KET 6: Micro- and opto-electonics: Microelectronics and opto-electronics for high speed communications and for better connectivity and mobility including Chipless/fabless Intellectual Property based developments and the development of Systems-on-a-chip (SOC) for information and communication terminals, and communication systems and networks.

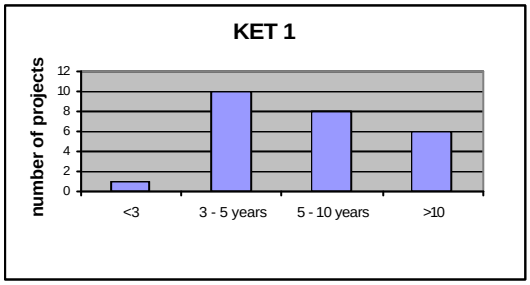
KET 7: Trust and confidence: Technologies and applications to support privacy, security, and users and suppliers rights, as well as tools and methodologies to improve technology and infrastructure dependability, adaptability and survivability.

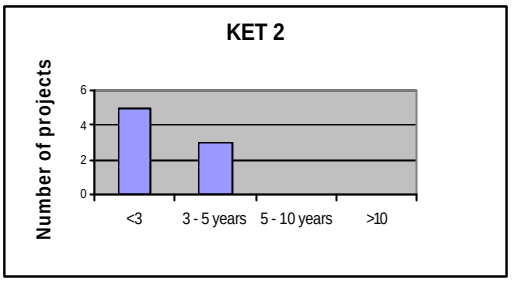
KET 8: Cross media content: Production and delivery including the integration of online and broadcasting services and technologies as well integrated authoring tools and applications in areas such as entertainment, advertising, publishing and education and training. "Context" based retrieval of, and access to content is a key feature of the ambient intelligence landscape.

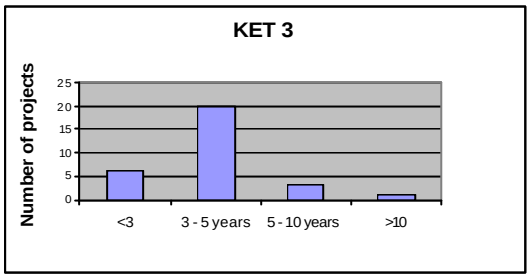
KET 9: Multi-modal and adaptive interfaces: Technologies to improve the interaction between people, information appliances and information services through the integration and use of multiple modalities, including language, gestures, haptic contacts, emotions, augmented, synthetic and virtual reality. Personalisation and intuitiveness of interfaces and their application in challenging areas are included.

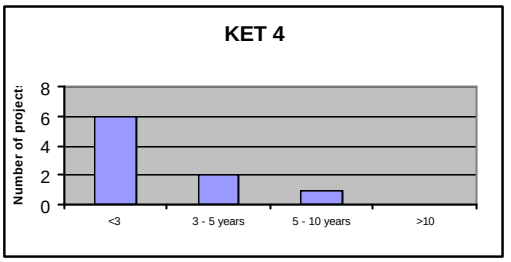
KET 10: Multilingual dialogue mode: Includes speech and language technologies to enable natural interaction with IST applications and services. Cross-lingual information retrieval and categorisation is included as well as contextual and deep semantic information analysis.

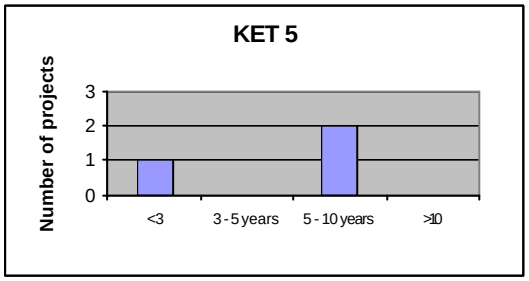
Annex 7: Time to market of KETs, RTD projects in call 3

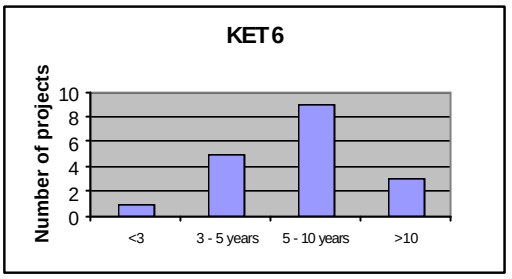


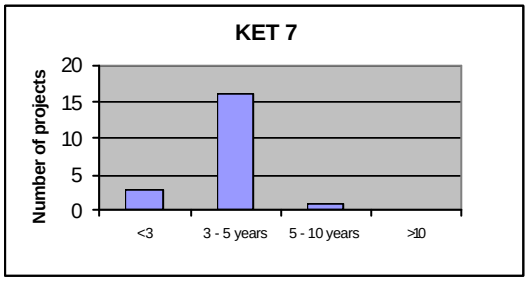


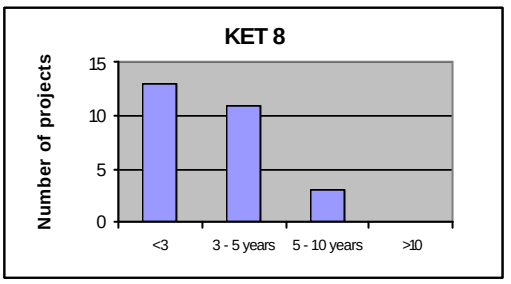


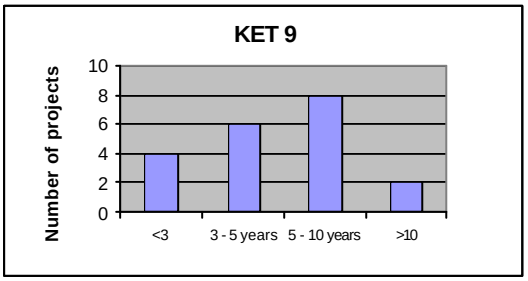


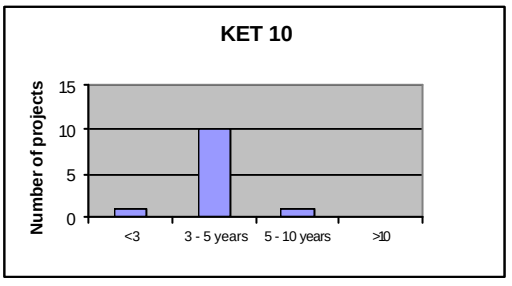








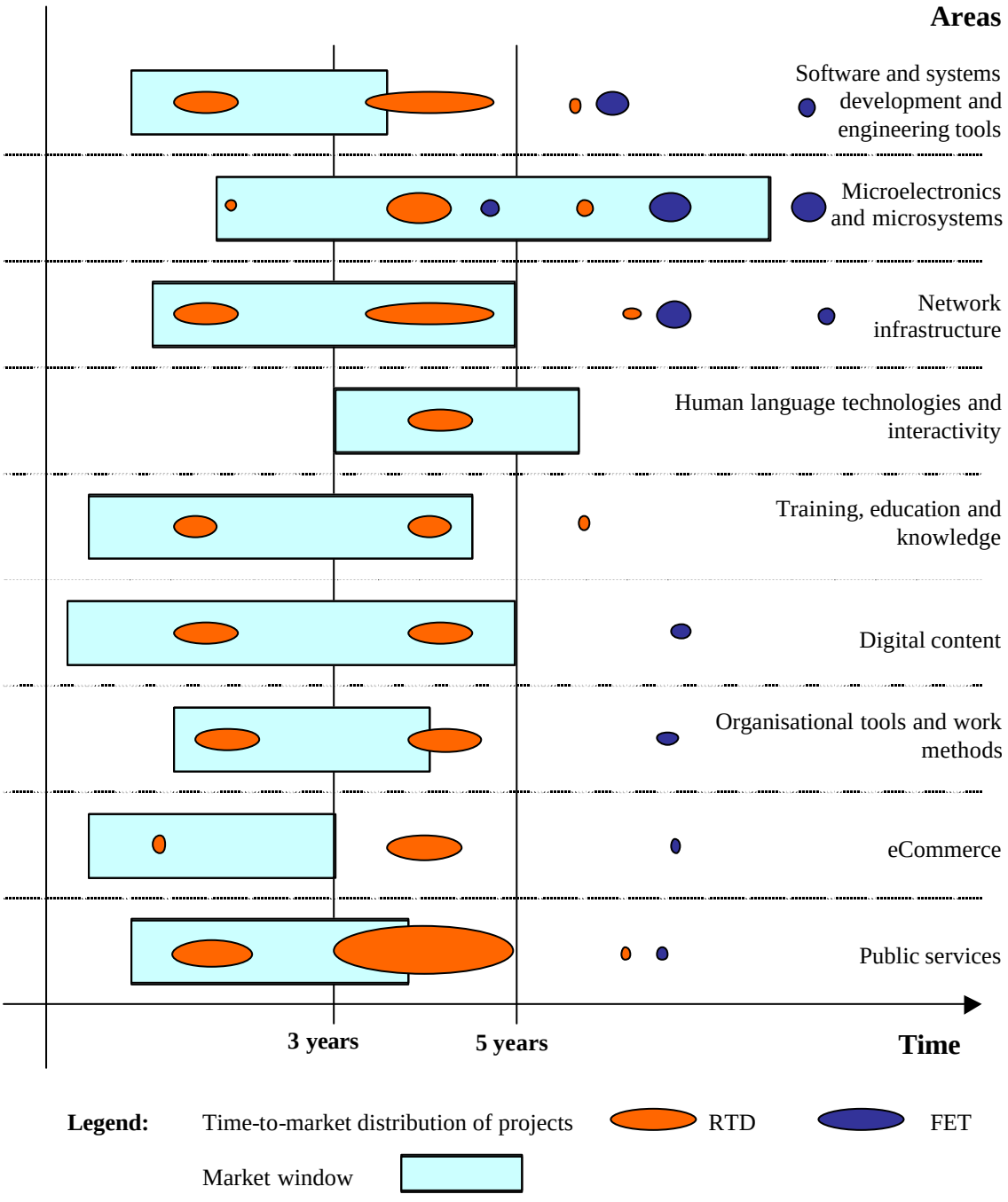




Annex 8: Risk Analysis

This figure gives an overview of Market Windows and projects' time-to-market for call 3. An overview for all calls is presented in Chapter 7.

- *Market Windows and projects "time-to-market" for call 3*



Technological challenge vs. market size
In paragraph 7.3 an analysis is given of the technological challenges versus the potential market size addressed. The following categories were defined:

Technical risk

LOW: low technical complexity with easy integration of existing technologies, easy problem to solve, technology available and limited adaptation needed.

MEDIUM: challenging but accomplishable, no need for deep effort or changes to technical path, just incremental advances to a known technical field.

HIGH: a real technical paradigm shift, a big challenge, significant obstacles to overcome, unavailability of components, risks linked to external availability of platforms, infrastructures, standards.

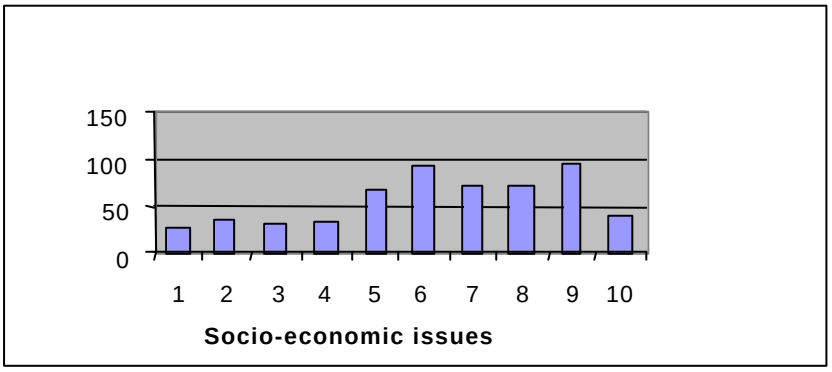
Potential market size

LOW: narrow market, evidently restricted economic benefit, limited return-on-investment, tight margins, a small and short-term market.

MEDIUM: a dynamic market offering significant potential return-on-investment, with active players, with promising margins even if not with a wide economic value.

HIGH: significant market potential for the project outputs, with low competition or high competitive advantage, strong demand or a new market with clear growth path.

Socio-economic issues addressed within the call 3
The coverage of socio-economic topics in the RTD projects of call 3 is shown below:



1. Employment
2. Social cohesion (less division between social groups)
3. Equal opportunities (women, disabled, etc.)
4. Environmental sustainability
5. Enhanced quality of life (improve balance in work, non-work, daily life)
6. Increased market competitiveness / growth
7. Increased access for all
8. Increased user friendliness
9. Increased social benefit / usefulness
10. Contributes to confidence and trust

The call 3 projects were scored against a list of 10 issues brought forward from the previous IPPA socio-economic analysis. A significant number of projects are addressing market competitiveness, increased social

benefit and user friendliness, increased access for all and improvements to quality of life. Call 3 addresses fewer issues such as environment, employment, social cohesion, confidence and trust and equal opportunities.

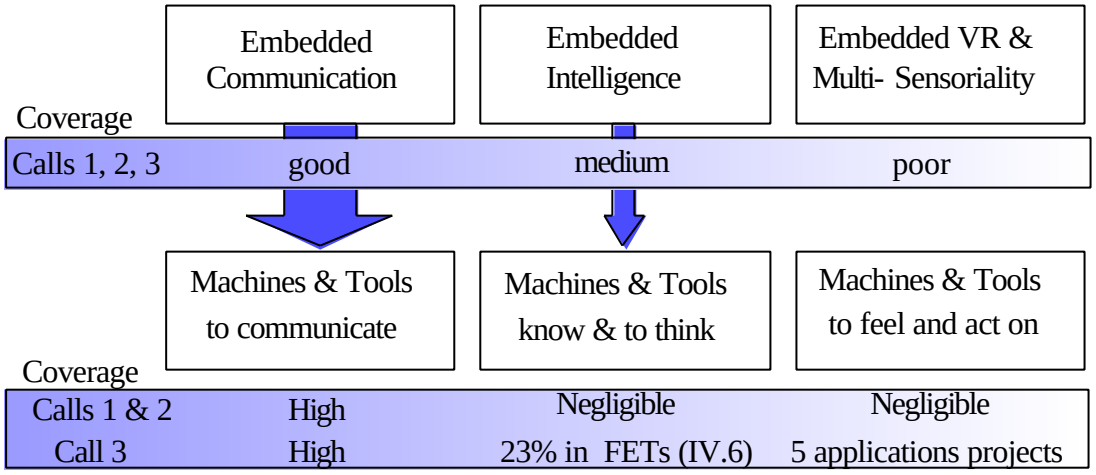
Annex 9: Strengths and weaknesses relevant to specific areas

- Application enabling technologies for modelling of physical systems and computational science and engineering are only marginally addressed in the third Call for projects. If not addressed in future calls, this could endanger the competitiveness of the European aerospace and automotive industries. It also implies that the technologies required for emerging visual environments and interactive and reactive systems may not be mastered to a sufficient level to allow timely development of products in the 5 to 10 year timeframe.
- Good coverage of KA1, action line 1.2, particularly for persons with special needs.
- Good coverage of cross-industry aspects in Key Action 2 projects
- In KA3, action line 3.2.1, the School of tomorrow, is addressed by about 8 projects with innovative ideas and high technology risk. Some of the projects have both high social and market risk, due to the changes required in teaching and learning methods
- The multimedia contents and tools projects in KA3 are mainly integration projects without high overall risk (medium or low market, technical and social risk).
- Most projects proposed in KA4, action line IV.6 (Interfaces making use of the various senses) contribute only to incremental advances in the domains of television, broadcasting, visual displays and audio-visual processing primarily by adding an element of interactivity. They do not integrate the use of multiple modalities in the way envisaged under KET 9: integration of language, gestures, haptic contacts, emotions, augmented, synthetic and virtual reality. Only one project out of 12 addresses the study of gestures as a new medium in call 3 and there is only one project on sonification (in FET).
- The programme can strengthen its activity in the domain of Virtual and Augmented Realities (VAR) including: real-time multi-sensorial simulation, real-time operating systems including dense synchronisation, multi-sensorial synchronisation, fast visualisation, fast sonification, gestural signal processing, haptic devices, motion capture, tri-signal coupling, artefacts, sensors and actuators for VAR. A small number of projects in KA IV.4 (4 out of 21) use current technologies to evaluate platforms and applications. In call 3 projects which fall in this domain are mainly in KAII and aim to develop specific applications with existing technologies: 2 projects out of 7 in KA I.2; 1 project out of 16 in KAII.2; 1 project out of 12 in KAIII.3. Additional projects will result from the CPA which is open in Call 4 on this subject and should be analysed in the next report.
- Within FET there has been a timely reaction to initiate research activities in nanoelectronics that look beyond current roadmaps and aim to complete the KAIV research in semiconductors by looking for paradigm shifts in the nano-scale regime. A broader range of applications (than microelectronics are today dealing with) is expected in the future from exploring the properties of matter and our interaction with it into the 'nano' regime. Paradigm shifts in sensors useful for medical and environmental applications will be of increasing importance in this area.
- The existing project portfolio in FET offers the opportunity for cross-fertilisation between the areas of micro-systems (micro-sensors and -actuators) and embedded distributed systems (distributed intelligence and perception).
- The FET projects on interfaces in Call 1 and 2 address mainly media applications, while multi-sensorial interfaces are not addressed.

Annex 10: Analysis of the area of multi-sensorial interfaces and Virtual & Augmented Realities

A pilot analysis was done in this IPPA exercise of the particular area of Multi-Sensory Interfaces and Virtual & Augmented Realities (VAR). The purpose was to try to provide a deeper view on the coverage, timeliness and expected impact of projects in this area, which has a capital role in the development of the ambient intelligence landscape. The approach has to be further elaborated in next exercises but seems to bring some additional explanations to the general findings such as the gap in the 5-10 year time window.

The following figure shows the coverage in Call 1, Call 2 and Call 3 of the area of Embedded systems in general. This area can be split into three categories: Embedded Communication, Embedded Intelligence and Embedded Multi-sensory Interfaces and VAR. The related categories of "tools" and "machines/devices" are: Machines & Tools to communicate, Machines & Tools to know and to think, Machines and Tools to feel and act on.



From the above coverage profile, one can extract the following

a) Embedded Communications begins to be well covered by projects in the different KAs, and as FET projects in call 3 (in the Disappearing Computer initiative) address Embedded and Distributed Intelligence.

b) Virtual realities (understood in a wider sense and not only as immersive systems) and multi-sensory (understood in a more large sense than multi-modality) convey a ***new paradigm***, in which the main technological difficulty concerns the implementation of a "synchronous dense reactivity", and which implements the paradigm "computing with (and for) feeling and acting on", complementary with the two others: "computing with (and for) communicating" and "computing with (and for) thinking".
In the calls 1,2 and 3, Virtual Realities and multi-sensory are understood not as a paradigm but are seen in a very restrictive sense as performing specific applications functions. As a consequence, the technical breakthroughs that this paradigm could offer are not fully addressed.

c) The following two observations are offered: (1) the projects in the interaction area and the lack of studies on new interfaces in RTD are restricted to the classical bi-modality, and (2) because innovations are restricted to the domain of Artificial Intelligence in FET, there is a lack of technological developments in the field of "computing with feeling" (distributed or not) and new uses of sensorial, communicating and intelligent computing. Taking these situations together, this probably results in a weakening of the research effort in multi-sensory interfaces and VAR technologies and applications in the 5-10 year time frame .

d) A shift paradigm in this area would be at the intersection of breakthroughs in the technology fields below. Almost all of these fields are addressed as separate topics in the programme but their integration into concepts such as “computing with feeling” is rarely addressed (only partially in FET). This is the sort of 5-10 year work that could be done in this area and that bridges the gap between “beyond the 10 year work” of FET and technology development in other areas.

Interfaces

- gestural transducers, multisensorial transducers ...
- new morphologies and metaphors in gestural and multisensorial tasks

Computing and simulation

- real time simulations with fast visualisation and sonification,
- new system architectures implementing hard synchronisation between processes and sensory inputs-outputs loops,

Micro-electronics

- new chips in micro-electronics, implementing computing capabilities and multi-sensory inputs and outputs functions
- new actuators and sensors
- integration, low cost, power consumption, wireless connectivity

Communications technologies

- evolution of the capacities of the communication channels (fibres and antennas),
- evolution of the structure of the networks to relay real-time multi-sensoriality

Power Supplies

- in the perspective of "disappearing Computer" and wireless communications
- etc.

The area could benefit from a Working Group to more deeply explore concepts such as “computing with feeling” and its contribution to the realisation of ambient intelligence.

Annex 11: Glossary

CPA	Cross Programme Actions
FET	Future and Emerging Technologies
Géant	The Géant project aims at putting in place a shared multibit, gigabit core network available to all of the national research networks across Western, Central and Eastern Europe.
IST programme	Information Society Technologies Programme - The 2nd Thematic Programme of the 5th Framework Programme, addressing issues towards a user-friendly Information Society.
ISTAG	Information Society Technologies Advisory Group
KA1	Systems and services for the citizen
KA2	New methods of work and electronic commerce
KA3	Multimedia content and tools
KA4	Essential technologies and infrastructure
KETs	Key enabling technologies
RN	Research networks
RTD	Research and technological development.
Support measures	The support measures run in parallel with the RTD, that are employed to prepare, support and facilitate the rapid adoption and subsequent transfer of technologies, experiences and know-how gained in RTD activities. Support measures include non-take up Accompanying Measures, Thematic Networks and Training Fellowships.
Take-Up measures	Measures stimulating diffusion and utilisation of technologies developed under RTD projects. Take-Up measures include Trials (evaluating promising but not fully established technology and methods), Best Practice actions (promoting take-up of well established technologies and methods) Assessments (evaluation of innovative products) and Access Actions (providing co-ordinated access to advanced, emerging technologies and services, knowledge and competence).
UMTS	Universal Mobile Telecommunications System
WP	Work programme

KK-35-01-982-EN-C

Further information is available from the IST Information Desk:
E-mail: ist@cec.eu.int
Phone: +32-2-296-8596
Fax: +32-2-296-8383

European Commission
Information Society Directorate-General

ISBN 92-894-0808-1