

Title: *Report on alignment of short-term research agendas of beneficiaries*

Authors: *FBK, Tilburg, UniDue*

Editor: *Raman Kazhamiakin, Antonio Bucchiarone (FBK)*

Reviewers: *Zsolt Nemeth (SZTAKI), Alexander Nowak (USTUTT)*

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Management Summary

This deliverable reports on the current alignment of the short-term research agendas of the individual beneficiaries and of the network as a whole. The analysis results presented in this document are based on a set of consolidated information elements obtained within this WP and within other integration and research WPs. The performed analysis aims to show how the research activities of the individual partners are aligned with the goals and objectives of the network. It also demonstrates how the research activities and results of the S-Cube as a whole are progressing with respect to the overall research agenda. Based on the inputs, the document reports on the positioning of the current status of the results and competences with respect to the research agenda and the S-Cube roadmap, identifying the possible gaps, misbalances, and overlaps that have may be adjusted and resolved.

Members of the S-Cube consortium:

University of Duisburg-Essen (Coordinator)	Germany
Tilburg University	Netherlands
City University London	U.K.
Consiglio Nazionale delle Ricerche	Italy
Center for Scientific and Technological Research	Italy
The French National Institute for Research in Computer Science and Control	France
Lero - The Irish Software Engineering Research Centre	Ireland
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Vision and Objectives of S-Cube

The Software Services and Systems Network (S-Cube) will establish a unified, multidisciplinary, vibrant research community which will enable Europe to lead the software-services revolution, helping shape the software-service based Internet which is the backbone of our future interactive society.

By integrating diverse research communities, S-Cube intends to achieve world-wide scientific excellence in a field that is critical for European competitiveness. S-Cube will accomplish its aims by meeting the following objectives:

- Re-aligning, re-shaping and integrating research agendas of key European players from diverse research areas and by synthesizing and integrating diversified knowledge, thereby establishing a long-lasting foundation for steering research and for achieving innovation at the highest level.
- Inaugurating a Europe-wide common program of education and training for researchers and industry thereby creating a common culture that will have a profound impact on the future of the field.
- Establishing a pro-active mobility plan to enable cross-fertilisation and thereby fostering the integration of research communities and the establishment of a common software services research culture.
- Establishing trust relationships with industry via European Technology Platforms (specifically NESSI) to achieve a catalytic effect in shaping European research, strengthening industrial competitiveness and addressing main societal challenges.
- Defining a broader research vision and perspective that will shape the software-service based Internet of the future and will accelerate economic growth and improve the living conditions of European citizens.

S-Cube will produce an integrated research community of international reputation and acclaim that will help define the future shape of the field of software services which is of critical for European competitiveness. S-Cube will provide service engineering methodologies which facilitate the development, deployment and adjustment of sophisticated hybrid service-based systems that cannot be addressed with today's limited software engineering approaches. S-Cube will further introduce an advanced training program for researchers and practitioners. Finally, S-Cube intends to bring strategic added value to European industry by using industry best-practice models and by implementing research results into pilot business cases and prototype systems.

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List of Acronyms

BPM	Business Process Management
IRF	Integrated Research Framework
KM	Knowledge Model
SAM	Service Adaptation and Monitoring
SED	Service Engineering and Design
SCC	Service Composition and Coordination
SI	Service Infrastructure
SQDNA	Service Quality Definition, Negotiation and Assurance

1 Introduction

One of the objectives of the Convergence Knowledge Model is to continuously provide information of research efforts being conducted and research actions being taken in order to provide a comprehensive understanding of how those research efforts and competencies fit into the larger body of knowledge relating to service-based applications. In this way, the Knowledge Model will be exploited in order to define short- and long-term research agendas of the S-Cube network beneficiaries and the overall research roadmap of the project as a whole. In order to guarantee the overall harmonization and the long-term integration of research within the network and to ensure that the undertaken research activities are properly streamlined according to the defined research agendas and the roadmap, there is a need to continuously monitor and evaluate this alignment and identify the necessary adjustments and coordination activities.

To achieve these objectives, the following tasks are identified within the WP-IA-1.1:

- T-IA-1.1.3 “Harmonization and Integration of Research Agendas” to guarantee such an overall harmonization and integration of the research activities in the S-Cube JRAs. To accomplish this, a periodical diagnosis of the research activities and results of the beneficiaries will take place. In this way, the diagnosis will identify research areas where progress is insufficient and areas where redundant or uncoordinated research efforts occur. This diagnostic will serve to define guidelines for the future research topics for S-Cube beneficiaries as well as guidelines for research re-alignment and possible collaborations between organizations and individuals external to the S-Cube network. To this end, this task will cater for the alignment of short-term research activities.
- T-IA-1.1.4 “Research Roadmap Sustainability” to commence streamlining, consolidating, re-organizing and realigning activities with respect to the research on SBAs in Europe on the basis of the Convergence Knowledge Model. This will happen through the definition of research roadmaps that will serve to promote a long-term view in the research strategies of the beneficiaries of the network, to direct the research of the broader research community of SBAs, and to provide an up-to-date description of long-term research challenges to the EU and to the national research bodies; e.g., by contributing to the strategic research agendas of ETPs.

1.1 Positioning of this Deliverable

The presented deliverable reports on the activities undertaken within the scope of the task T-IA-1.1.3. Specifically, it reports on the current alignment of the short-term research agendas of the individual beneficiaries and of the network as a whole. The analysis results presented in this document are based on a set of consolidated information elements obtained within this WP and within other integration and research WPs. In particular, it uses the information about

- the competences of the individual S-Cube beneficiaries defined and reported in the Convergence Knowledge Model;
- the research results obtained by the individual beneficiaries within the research activities and WPs, reported as the scientific publications and also as a part of the Integrated Research Framework;
- the research problems identified within the research WPs and reported in the Integrated Research Framework by the project as a whole (i.e., research challenges) and by the individual partners (i.e., research questions).

The performed analysis aims to show how the research activities of the individual partners are aligned with the goals and objectives of the network. It also demonstrates how the research activities and results of the S-Cube as a whole are progressing with respect to the overall research agenda.

Based on the inputs, the document reports on the positioning of the current status of the results and competences with respect to the research agenda and the S-Cube roadmap, identifying the possible gaps, misbalances, and overlaps that have may be adjusted and resolved.

The deliverable is structured as follows. In Chapter 2 we present the analysis approach underlying the diagnosis activity presented in the report. Specifically, we define the input information used to perform the evaluation of the current status, and define the set of measurement criteria that will be exploited for the evaluation. In Chapter 3 we present the results of the evaluation of the current situation with respect to the identified measurements, and Chapter 4 will represent the results of the analysis of the alignment of short-term research agendas.

1.2 Relation to other WPs

To perform the analysis activities reported in this document and undertaken in the task T-IA-1.1.3, the work is done in a tight collaboration with other S-Cube activities and WPs. Furthermore, the results of the analysis will also be used to drive and align certain activities in the other WPs. More specifically, the relation between this deliverable and the S-Cube WPs and activities are the following:

- The results obtained within the S-Cube research activities (JRA-1 and JRA-2) will be analyzed in order to understand the progress of the research towards the coverage of the S-Cube strategic areas and roadmap. The results of the analysis will allow for better understanding of the coordination actions that the individual WP research activities should undertake in order to avoid overlaps or in order to better cover the missing areas and objectives.
- The model and results presented by the Integrated Research Framework defines the key elements constituting the research agenda of the beneficiaries and of the network as a whole. These elements, namely the research challenges and research questions, will be evaluated here in order to analyze the contributions of individual beneficiaries to the different research areas and objectives. We remark that this activity is different from the IRF validation activities undertaken in WP-IA-3.2, as the latter aims at analyzing the structure and evolution of the IRF, while here we are targeting the progress and alignment of the research activities of beneficiaries with respect to the research agenda, and of the network as whole with respect to the strategic areas and challenges.
- The S-Cube mobility program aims to support the integration and exchange of competences between the beneficiaries through the mobility of researchers. The corresponding WP also targets the identification of mobility opportunities for beneficiaries by analyzing their competences, research dependencies, and activities within JRAs. Specifically, in Deliverable IA-2.1.2 a set of scientific subjects for mobility as an outcome of the analysis of the competences of the beneficiaries. These subjects, that refine the main research areas of S-Cube, make part of the research agenda of the S-Cube beneficiaries and will also be exploited in the analysis presented in the current document. Furthermore, the results of the analysis, which are based on a wider set of materials and inputs, will contribute to the identification of mobility opportunities with the gaps and misalignments of the research agendas.

We remark that the goal of the task T-IA-1.1.3 is to guarantee the harmonization of the research activities in the S-Cube JRAs, that is, the alignment and integration of research agendas of individual beneficiaries with each other and with respect to the S-Cube research roadmap. On the contrary, the alignment of the S-Cube research agendas with respect to industry agendas is a subject of analysis undertaken in the Integration Activity IA-2.2 “Alignment with European Industry Practices”.

2 Alignment Evaluation

In this chapter we present the approach exploited in the WP for the diagnosis of the alignment of the research agendas of the S-Cube beneficiaries as well as of the whole network. We will also present the set of input materials used for this diagnosis and define a set of criteria applied for the qualitative and quantitative evaluation.

2.1 Approach

The analysis approach applied in this activity aims to answer the following questions.

First, we would like to understand how the research agenda of the S-Cube network is being filled in with the results as a whole. That is, how the results obtained by the members of the consortium contribute to the research problems and strategic areas.

Second, it is necessary to understand the alignment of the research agendas of the individual beneficiaries of the network. Specifically, this means (i) to see how the agendas and results of the individual S-Cube partners are aligned with respect to the S-Cube research agenda, and (ii) to see the progress of the individual partners with respect to their own research agendas.

Third, for the purpose of the coordination and alignment of the research activities in JRAs, it is necessary to evaluate how the individual research agendas and results of the beneficiaries are aligned with each other. In other words, we have to understand the degree of integration of research results and research activities of the S-Cube members.

The following table summarizes the analysis activities represented in this report and the usage of the analysis results foreseen in the next phases of the project.

Table 1: Alignment analysis questions

Analysis Activity	Usage of the Result
Alignment of the research results with respect to the research agenda and roadmap of S-Cube	1. Identification of gaps in the competences of the network as a whole. 2. Identification of areas and problems that may require additional research efforts
Analysis of the integration of research agendas and results	3. Identification of possible overlaps to foster further integration and joint research activities
Alignment of the research agendas of the individual beneficiaries	4. Adjustment of the individual agendas of the beneficiaries in order to improve the overall results in specific areas

2.2 Analysis Materials

To represent the research agenda and the roadmap of the network as a whole and of the individual beneficiaries, we will use the following components:

- **S-Cube research agenda** is represented with the following two elements. First, it is defined by the strategic research areas of the network [1], namely with the Service Technologies areas (BPM, SCC, and SI) and the Technology Principles, Techniques, and Methodologies (SED, SAM,S QDNA). Second, in relation to these areas, the S-Cube research roadmap defines the cross-cutting research challenges and objectives [3,4].
- **Research agendas of individual beneficiaries** is defined with the research areas in which the beneficiary develops its competences and expertise, the specific scientific subjects that refine

the research areas [2], and the specific research questions the beneficiary has defined in the scope of the research challenges [4].

The complete list of research questions and research challenges can be found in the IRF tool¹. The list of scientific subjects has been already defined in CD-IA-2.1.2 as a result of the analysis of the competences of the S-Cube beneficiaries reported in the Knowledge Model.

The evaluation reported in this document is based on the following sets of inputs.

First, the competences of the beneficiaries associated with the Knowledge Model terms will be used to evaluate the contribution and relations of the beneficiaries to the S-Cube research areas.

Second, the research outcomes of the beneficiaries will be exploited in order to answer various analysis questions defined above. These research results will be collected from the IRF.

Third, we will also explore separately the information about joint research results in order to evaluate the integration of the research agendas.

2.3 Criteria

To answer the analysis questions defined in Section 2.1, we have identified a set of qualitative and quantitative criteria. The criteria are represented in Table 2. We remark that some of these criteria correspond to the Key Performance Indicators identified in the S-Cube Description of Work.

Table 2: Analysis criteria

#	Criteria	Description	Analysis question
1	Coverage of research areas by research results	Show the distribution and balance of the research results of partners across S-Cube research areas. This will help to identify the research areas, where the competences and achievements are missing	Alignment of S-Cube research agenda
2	Coverage of research challenges by research results	Show the distribution and balance of the research results of partners across S-Cube research challenges. This will help to identify the challenges requiring particular research attention	Alignment of S-Cube research agenda
3	Coverage of research areas by competences	Show the distribution of the competences reported by the S-Cube beneficiaries across research areas. This will help to identify missing S-Cube competences	Alignment of S-Cube research agenda
4	Coverage of research areas by joint publications	Show the degree of integration between partners with respect to the specific research areas	Integration of individual agendas
5	Coverage of research areas with independent results	Identify possible overlapping/duplication of work at the level of specific research areas. This analysis will take into account the results of previous two criteria.	Integration of individual agendas

¹ At the moment of writing this document the IRF web tool is internally available to the S-Cube beneficiaries.

6	S-Cube beneficiaries working in a specific research area	From the reported competences, research questions and results, identify how the different partners contribute to the different areas. This will help us to understand the alignment of the agendas of partners and to find potential overlaps	Alignment of individual agendas
7	S-Cube beneficiaries working on a specific research challenge	From the reported research questions and results, identify how the different partners contribute to the different challenges. This will help us to understand the alignment of the agendas of partners and to find potential overlaps	Alignment of individual agendas
8	Research questions of S-Cube beneficiaries already covered by the research results	Show how the research questions identified by the individual partners are covered by the results. This will allow for understanding the progress of the partners towards their objectives.	Alignment of individual agendas
9	Coverage of competences with the research results of S-Cube beneficiaries	Show the relationships between the competences of the beneficiaries and the results they achieved. On the one hand, this will allow for checking the alignment of the KM with the S-Cube progress, and on the other hand to see the development of individual competences.	Alignment of individual agendas

We also note that the results of some of the criteria are already presented in other S-Cube materials. In particular, the criteria 1 and 2 are identified and discussed in Deliverable CD-IA-3.2.2 [5]. To some extent also the results of the criterion 3 have been presented in the previous deliverable of WP-IA-1.1 and of WP-IA-2.1. Here we recap those results for the completeness, focusing on the specific aspects of this activity.

3 Criteria Evaluation

In order to evaluate the criteria presented in Table 2, we have performed the analysis of the input materials presented in Section 2.2 in different ways. As for the analysis of the input data from the Integrated Research Framework, namely the research results obtained, their relation to the research areas, challenges, and questions, as well as to the S-Cube beneficiaries, we heavily exploited the IRF tool [4,5]. More specifically, for each of the corresponding criteria we have identified a set of SQL queries that provide the necessary quantitative and qualitative results. In this way, we have provided the results for the following criteria:

- *Coverage of research areas by research results.* Through the association of the research results to the research questions and of the research questions to the element of the IRF model, we have identified the relation of the research results to the research areas that correspond to the specific elements of the Conceptual Research Framework IRF view [4]. The results are presented in Annex A3, where the distribution of the research results to the research areas is shown.
- *Coverage of research challenges by research results.* In a similar way, the association of research results to questions to challenges in IRF model has been exploited. The results are presented in Annex A4, where the distribution of research results to the research challenges is shown.
- *S-Cube beneficiaries working in a specific research area.* To provide the mapping of the S-Cube beneficiaries to the research areas, we exploited the information about the research questions identified by the beneficiaries and about the research results they have provided (possibly jointly with the other S-Cube beneficiaries). The results of this mapping are shown in Annex A5, where the beneficiaries are mapped to the specific areas through the relations of the questions and results as above.
- *S-Cube beneficiaries working on a specific research challenge.* To provide a mapping of the beneficiaries to the research challenges, we again exploited the relations between research questions and results provided by the partners to the S-Cube research challenges. The results are represented in Annex A6.
- *Research questions of S-Cube beneficiaries already covered by the research results.* To estimate the progress of the beneficiaries with respect to the short term research problems identified by the partners, we compared the number of research questions on which partner is working (i.e., the questions that the partner has identified and/or other questions for which the partner has provide a result), with those question, for which the partner provided a result. The results are presented in Annex A7.
- *Coverage of research areas by joint publications.* This has been achieved by checking the research results with more than one S-Cube beneficiaries. The results of the distribution of joint publications across research areas are presented in Annex A8.
- *Coverage of research areas with independent results.* To see how many of the results in a specific research area are obtained by the partners independently, we have checked the research results reported in IRF, which have authors only from one of the S-Cube participating institution. The results of the distribution across the research areas are shown in Annex A9.

Second, we exploited the information regarding the competences of the beneficiaries reported and collected within the Knowledge Model. Specifically, we used this information to identify the following criteria:

- *Coverage of research areas by competences.* That is, we have analyzed how the competences of the individual beneficiaries are distributed across S-Cube research areas. The results of the analysis are shown in Annex A10. We also use the competences of the S-Cube associated members to complement the competence information in Annex A12.
- *Coverage of competences with the research results of S-Cube beneficiaries.* The relation between the competences reported by the S-Cube beneficiaries and the research results they have obtained (individually or jointly with other partners) is presented in Annex A11.

4 Analysis of Results

In this chapter we present the results of the analysis activities with respect to the questions presented in Chapter 2.

4.1. Alignment of the research results with respect to the research agenda and roadmap of S-Cube

As we mentioned in Chapter 2, we will analyze the alignment with respect to the research areas of S-Cube and of the research challenges that form the research agenda of the project. We will try to characterize the obtained results across the competences of the beneficiaries (i.e., the current expertise of the project), the research efforts (i.e., distribution of research activities of the beneficiaries across the areas), and the progress made (the research results obtained so far).

4.1.1 Competences

As for the research areas, the results of the criteria evaluation demonstrate that the S-Cube research areas are well covered by the competences of the S-Cube beneficiaries. Possible lack of competences in the area of Service Infrastructure may be compensated by the strong expertise of associated members as shown in Annex A12.

4.1.2 Research Efforts

As it is shown in Annex A5, the distribution of the research efforts across the areas is not equal. Indeed, the activities in cross-cutting research aspects (Service Engineering and Design, Service Adaptation and Monitoring, and Service Quality Definition, Negotiation, and Assurance) show higher involvement than in the technology areas. This is explained by the following reasons. First, the activities in the technology areas also aims to address the cross-cutting aspects, and therefore the research efforts contribute in this way to different areas. Second, the activities in those areas are more focused and concentrate on very specific problems.

As for the research challenges, also here the distribution of the research efforts is not equal (Annex A6). Specifically, the challenges related to the business process models, HCI and User aspects in service engineering and provisioning, prediction techniques, internet of things have been less addressed by the efforts of the S-Cube beneficiaries. Again, some of those challenges are very specific (e.g., Monitoring of Quality Characteristics of Service Orchestrations and Service Choreographies), and some of them still to be addressed by the members of the project.

4.1.3 Research Results

The conclusions made in Section 4.1.2 are somehow confirmed by the information presented in Annex A3 (distribution of research results across research areas) and Annex A4 (distribution of research results across research challenges). Technology areas of BPM and Service Infrastructure require more results on the specific techniques and technological solutions than on their relation to the cross-cutting aspects such as adaptation and monitoring. For some of the relevant challenges there were no results produced yet, and this has to be improved in the upcoming phases of the project.

4.2. Analysis of the integration of research agendas and results

To analyze the progress towards integration and alignment of research agendas and results of the beneficiaries, we look at the distribution of joint and independent results across the research areas (Annex A8 and Annex A9 respectively). From those figures one can see that the level of consolidation of research in some of the areas is higher than in the others. Indeed, the number of the joint results in the areas of Service Engineering and Design and in Service Quality Definition, Negotiation and Assurance prevails over the number of independent results, while for example the number of independent results in Service Adaptation and Monitoring area is much higher (19 versus 13). The

reason is due to the fact that the results in this area come from different WPs and beneficiaries and therefore more alignment and consolidation activities should be fostered in this (but also in some other) area.

4.3. Alignment of the research agendas of the individual beneficiaries

The alignment and progress of individual beneficiaries is based on the following pieces of information. First, we use the information about the competences of the beneficiaries (Annex A2) and their distribution to the research areas (A10). This provides the basis for understanding the expertise of the beneficiaries. We then compare it with the research results the beneficiaries obtained in their expert fields (A11), which allows us to understand how the expertise of the beneficiary is exploited within the scope of S-Cube and how it evolves over time. Second, we look at how the research questions to which the beneficiaries participate are covered with the research result (chart in Annex A7). This allows us to understand the progress of the beneficiaries with respect to their research activities.

The result of the first evaluation is reflected in Annex A11. Specifically, the table show the number of research results provided by the beneficiary in different areas of his expertise. It is possible to see that for some of the partners not all their competences have been fully exploited in the scope of the S-Cube activities. Another important result is that the competences of the partners in the area of business process management are not exploited so far. This partially reflects the considerations discussed in Section 4.1.

On the other hand, as one can see in Annex A11 many of the beneficiaries have gained results and therefore new expertise in new fields. In the table presented in Annex A11 this is shown with “+” before the number of results of the beneficiary in the area. Specifically, many new partners have obtained (jointly with other partners) the results in the areas of Service Engineering and Design, Service Adaptation and Monitoring, Service Composition and Coordination. This is a very positive result of the project that shows the spread of the research activities across different areas of expertise and the high level of integration of the partners from different communities.

The results of the second evaluation are shown in the chart in Annex A7. It shows how many questions, on which the beneficiary works are already covered with the results of that beneficiary, i.e., shows the progress of individual partners towards their research activities. The analysis shows that with some exceptions those activities are rather aligned; the number of non-covered questions is small. The deeper analysis of those questions allows us to explain those deviations by the fact that those questions have not yet been streamlined within the activities of the S-Cube work packages, but are planned in the next phases of the project. Indeed, to assess this consideration future evaluations are needed and will be performed in the scope of the KM activities.

5 Concluding Remarks

In the presented document we have reported the activities undertaken within the scope of the task T-IA-1.1.3. In particular, the analysis results of the current alignment of the short-term research agendas of the individual beneficiaries and of the network as a whole are reported. The results presented in this are based on a set of consolidated information obtained within this WP and within other integration and research WPs.

While the analysis presented above shows that in general high degree of integration and alignment of research activities among the S-Cube beneficiaries is achieved, there are still some issues to be considered.

As an overall strategy, the analysis advises to shift certain research efforts towards research activities within the technology areas, and in particular, in BPM and Service Infrastructure areas. This may be achieved by integrating the research efforts with the experts among the associated members or even other external institutions considering the new partnership relations with them. Another possibility to increase the critical mass in those areas is to adequately involve the partners with the corresponding competences that are not currently involved in those activities. This is specifically the case for the BPM area, where a lot of experts currently do not exploit their competences in that field within the scope of S-Cube project. More concretely such partners as UCBL, UOC, UniHH, and FBK may contribute more results jointly with other partners in that area.

While in overall the project has provided a good record of joint research efforts and results, there is still space for improvement in certain areas. As the analysis show, in certain areas the number of the independent and potentially overlapping results is still high; further collaborations and alignment activities should be fostered. This concerns the areas of Service Adaptation and Monitoring, Service Infrastructure, and Service Composition and Coordination.

More focused integration and alignment activities are necessary also at the level of individual partners. For some beneficiaries certain results have to be achieved across the research activities they carry out. Again, the situation may be improved by fostering collaborations between such partners and the beneficiaries that are experts in that area. We remark that such collaborations that may be enabled by the S-Cube mobility program should not necessarily happen within a single work package. Instead, in many cases in order to overcome the problem it will be necessary to encourage cross-WP collaborations.

References

S-Cube Deliverable CD-IA-1.1.3. *“Integrated Knowledge Model”*.

S-Cube Deliverable CD-IA-2.1.2. *“Identification of Scientific Subjects and Partners for Mobility”*

The S-Cube Team. *“S-Cube’s Global Vision”*. 2009

S-Cube Deliverable CD-IA-3.1.3. *“First Version of Integration Framework”*.

S-Cube Deliverable CD-IA-3.2.2. *“Results of the First Validation”*

Appendix A

A1. List of Research Challenges (from the IRF)

The list of research challenges represented here corresponds to the challenges defined in the Integrated Research Framework (IA-3.1).

	Research Challenges
RC1	Analysis and Prediction of Quality Characteristics of Service Compositions
RC2	Business Transactions in Service Networks
RC3	Comprehensive and integrated adaptation and monitoring principles, techniques, and methodologies
RC4	Context- and HCI-aware SBA monitoring and adaptation
RC5	Definition of a coherent life cycle for adaptable and evolvable SBA
RC6	Deployment and execution management
RC7	End-to-end processes in Service Networks
RC8	End-to-End Quality Reference Model
RC9	Exploiting user and task models for automatic quality contract establishment
RC10	Formal Models and Languages for QoS-Aware Service Compositions
RC11	HCI and context aspects in the development of service based applications
RC12	Measuring, controlling, evaluating and improving the life cycle and the related processes
RC13	Mixed initiative SBA adaptation
RC14	Monitoring of Quality Characteristics of Service Orchestrations and Service Choreographies
RC15	Multi-level and self-adaptation
RC16	Proactive Adaptation and Predictive Monitoring
RC17	Proactive SLA negotiation and agreement
RC18	Process mining for service discovery
RC19	QoS Aware Adaptation of Service Compositions
RC20	Quality Prediction Techniques to Support Proactive Adaptation
RC21	Rich and Extensible Quality Definition Language
RC22	Run-time Quality Assurance Techniques
RC23	Understand when an adaptation requirement should be selected

A2. Competences of the S-Cube Beneficiaries and Associated Members

The competences listed here correspond to the competences entered by the partners in the S-Cube Knowledge Model. It reflects the competences of the S-Cube beneficiaries and of the associated members.

Beneficiary	Competences
UniDue	Engineering Adaptive Service Based Systems Quality Assurance Requirements Engineering Requirements And Model Based Testing

	<p>Software Architecture Software Product Line Engineering And Variability Management</p>
Tilburg	<p>Business Process Management E Business Quality Assurance Requirements Engineering Service Architectures Service Composition Service Design & Modeling Methodologies Service Evolution Service Infrastructure Service Networks Software Processes</p>
CITY	<p>Centre For Hci Design Inclusive Design And Social Aspects Of Computing Inclusive Design And Social Aspects Of Computing, Interaction Design And Research Inclusive Design And Social Aspects Of Computing, User Centred Requirements Engineering Interaction Design And Research Requirements Engineering, Service Centric Systems Engineering Service Centric Systems Engineering User Centred Requirements Engineering</p>
CNR	<p>Designing Efficient Algorithms For Service Provisioning Discovery Of Human Based Services Dynamic Adaptation Of High Performance Components Estimation Of The Quality Of Service Providers Grid Computing Grid Workflow Modeling And Enactment Scheduling Scheduling Policies On Grid Self * In Service Execution</p>
FBK	<p>Distributed Business Processes Service Level Agreements Service Oriented Applications</p>
INRIA	<p>Collaborative Model Driven Engineering Component Based Software Development Engineering Adaptive Component Based Systems Engineering Adaptive Service Based Systems Grid Computing Model Based Testing Model Driven Engineering Model Driven Service Composition Monitoring Design Principle And Monitoring Framework Monitoring Framework Quality Of Services In Component Based Systems Service Based System Testing</p>

	<p>Software Architecture Evolution Software Engineering Testing</p>
Lero-UL	<p>Software Process Software Quality Business Process Social Network Analysis Maintenance Risk Management Configuration Management Software Process in Regulated Industry Software Process in SMEs Global Software Development</p>
POLIMI	<p>Adaptive Web Services Context Aware Invocation Of Web Services Context Aware Invocation Of Web Services & Web Service Design Data And And Information Quality Data And Information Quality Dependable Evolvable Pervasive Se Dependable Evolvable Pervasive Se And Monitoring Flexible And Self Healing Web Services Monitoring Negotiation And Qos Agreement Quality Assurance Requirement Engineering Security Service Composition Service Composition And Service Oriented Computing Service Design & Modeling Methodologies Service Oriented Computing And Service Composition Software Engineering Software Engineering Life Cycle Web Service Orchestration And Qos Optimization Web Service Orchestration And Qos Optimization & Negotiation And Qos Agreement Web Service Retrieval Web Service Retrieval & Adaptive Bpel Process Execution Based On Quality Constraints Web Service Retrieval, Flexible And Self Healing Web Services And Context Aware Invocation</p>
SZTAKI	<p>Grid Brokering Grid Computing Grid Workflow Modeling And Enactment Mercury Grid Monitoring System Multi Level Grid Scheduling Nature Inspired Coordination Models ? Service Deployment Using Virtualization Sla Based Resource Virtualization Approach For On Demand Service Provision</p>
TUW	<p>Business Process Optimization</p>

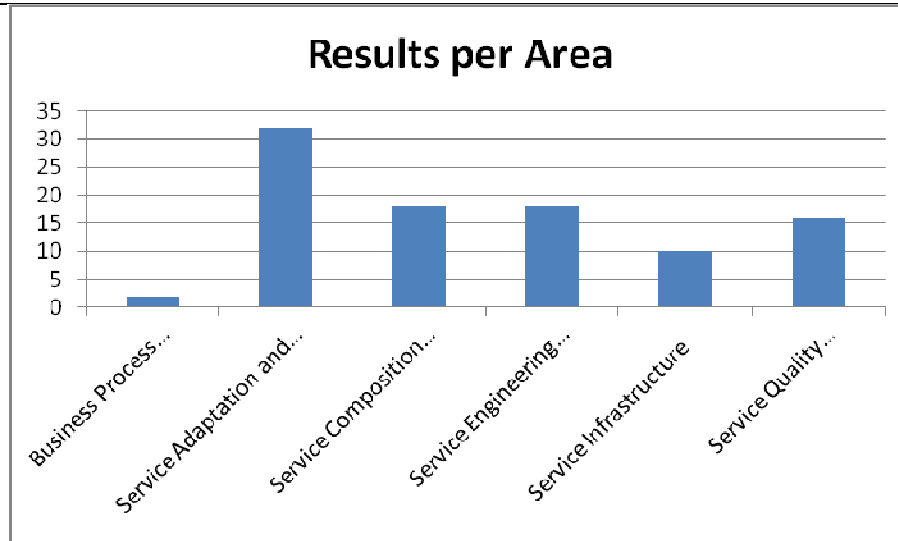
	<p>Dependency Analysis In The Context Of Bam Dynamic Binding And Invocation Of Web Services Dynamic Rebinding Of Services Dynamic Service Binding Management Of Web Service Evolution Measuring Qos Metrics Of Web Services Mediation Of Web Service Invocations Monitoring Key Performance Indicators Monitoring Service Response Times Quality Of Service Aware Web Service Composition Service Compositions Stateless Web Services Testing Of Sbas Vresco Web Service Mediation Wsrfl</p>
UCBL	<p>Adaptation In Business Protocol Authorisation Policies BPM Business Process Management And Service Composition Business Protocols Business Security Context Driven Business Process Adaptation E Business Formal Verification Privacy Privacy Aware Web Services Agreement Privacy Aware Web Services Service Engineering Service Evolution Transactional Web Service</p>
UOC	<p>Formal Description Languages Providing Enriched Service Behavior Specification Primitives (Pre /Post Conditions, Service Invariants, Quality Of Service) With The Use Of Ontologies For Complex Services Semantically Enriched Service Discovery Mechanisms Employing Semantic Similarity Measures For Matching Functional Goals And Non Functional Requirements Service Composition. Service Oriented Computing Service Value Networks</p>
UPM	<p>Formal Methods Multi Party Business Protocols Resource Analysis, Multi Party Business Protocols Software Engineering, Static Analysis, Abstract Interpretation, Resource Analysis Software Engineering, Static Analysis, Resource Analysis</p>
USTUTT	<p>Adaptation Of Service Composition</p>

	Adaptation Of Service Compositions Business Process Management Enterprise Application Integration Monitoring Of Kpis Monitoring Of Service Composition Monitoring Of Service Compositions Service Choreography Service Composition Service Infrastructure Service Oriented Computing
UniHH	Business Process Management Context Management And Mobile Computing Decentralized Process Execution Self Organizing Systems Service Composition Service Oriented Architecture Service Oriented Architectures Service Oriented Computing
VUA	Service Architectures Service Design & Modeling Methodologies Service Oriented Software Engineering Software Architecture Software Engineering
Associated Members²	
Manchester Business School	Service Technologies Service Based Applications
STI Innsbruck	Web Service Technologies
Universitat Politècnica de Catalunya (UPC)	Service Oriented Computing Service Oriented Requirements Engineering
University of Dortmund	Grid Computing Service Oriented Architecture SLA Management
University of Lugano	Grid Computing Rest And Web Services Web Services

A3. Distribution of Research Results across Research Areas

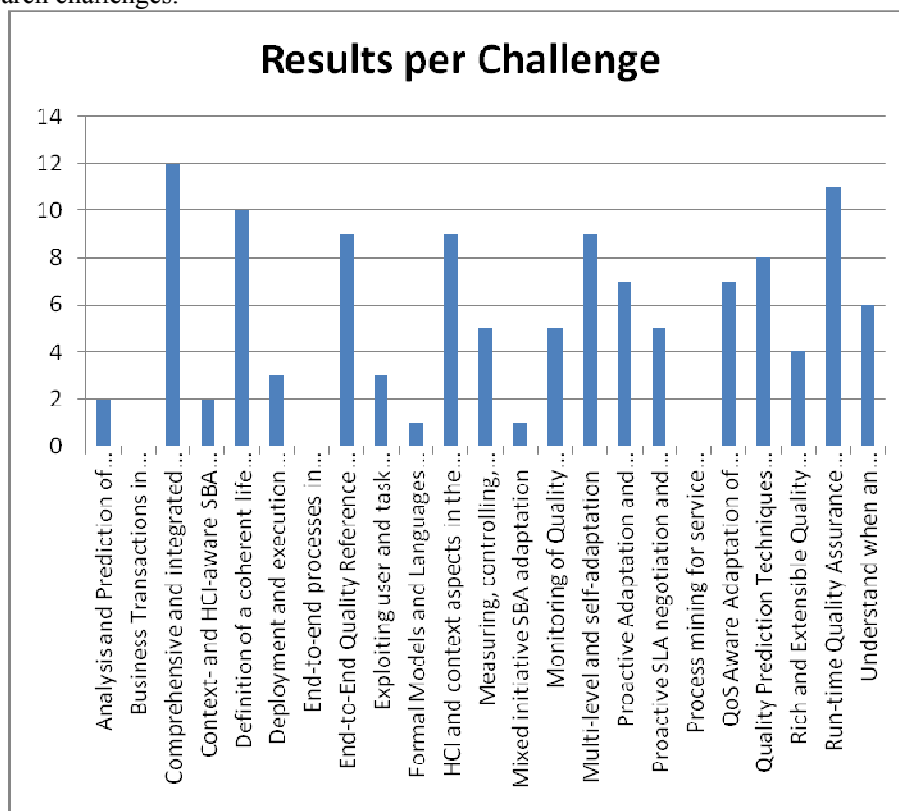
The following chart represents the distribution of the research results reported in IRF across the S-Cube research areas, namely “Business Process Management”, “Service Adaptation and Monitoring”, “Service Composition and Coordination”, “Service Engineering and Design”, “Service Infrastructure”, “Service Quality Definition, Negotiation, and Assurance”,

² Here we list only those associate members, for which the competences have already been reported in KM



A4. Distribution of Research Results across Research Challenges

The following chart represents the distribution of the research results reported in IRF across the S-Cube research challenges.



A5. S-Cube Beneficiaries Working in Research Areas (from research questions and results)

The following table represents the mapping of the S-Cube beneficiaries to the research areas. The mapping is based on the research questions defined by the beneficiaries and on the research results they obtained and the relation of these questions and results to the research areas through the links to the corresponding elements of the Conceptual Research Framework as defined in IRF.

Beneficiary	SED	SAM	SQDNA	BPM	SCC	SI
UniDue	X	X	X		X	
Tilburg	X	X	X			
CITY	X	X	X			
CNR		X	X	X	X	X
FBK	X	X	X		X	
INRIA		X	X		X	X
Lero-UL	X	X				
POLIMI	X	X	X	X	X	
SZTAKI	X	X	X		X	X
TUW	X	X	X		X	X
UCBL	X	X	X			
UOC	X	X	X		X	
UPM	X	X	X		X	X
USTUTT	X	X	X	X	X	
UniHH					X	
VUA	X	X				
Total	13	15	13	3	11	5

A6. S-Cube Beneficiaries working on a Research Challenge (from research questions and results)

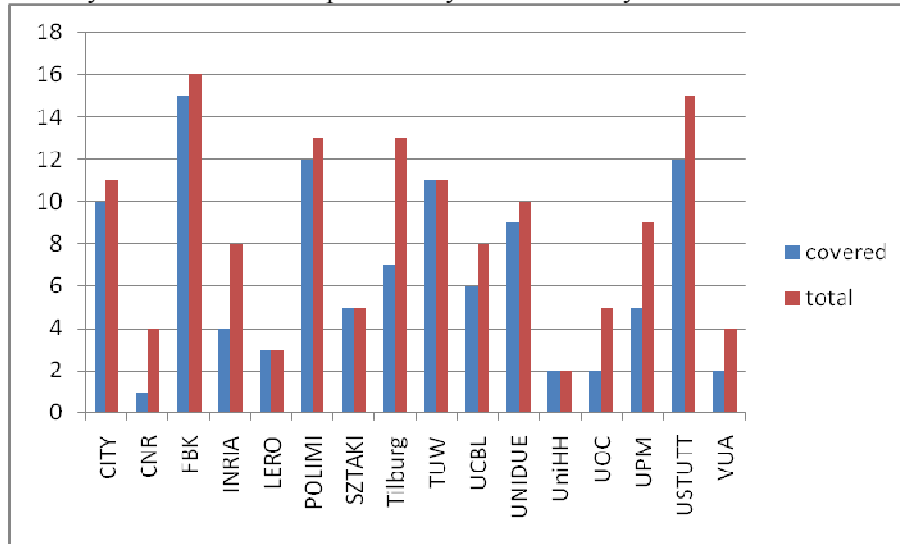
The following table represents the mapping of the S-Cube beneficiaries to the research challenges. The mapping is based on the research questions defined by the beneficiaries and on the research results they obtained and the relation of these questions and results to the challenges as defined in IRF.

Challenge	U n i D u e	T i l b u r g	C I T Y	C N R	F B K	I N R I A	L e r o - U L	P O L I M I	S Z T A K I	T U W	U C B L	U O C	U P M	U S T U T T	U n i H H	V U A	T o t a l
RC1										X			X	X			3
RC2		X				X								X			3
RC3	X	X	X	X	X	X		X	X	X	X			X			11
RC4	X		X														2
RC5	X	X			X		X	X		X		X		X		X	9
RC6								X	X								2
RC7																	0
RC8	X	X	X		X	X		X	X	X	X		X	X			11
RC9			X					X			X	X					4
RC10												X	X				2
RC11	X	X	X		X			X		X	X		X				8
RC12		X	X							X							3
RC13								X	X							X	3
RC14								X					X	X			3
RC15				X		X		X	X					X			5
RC16	X			X	X	X			X	X			X	X			8
RC17		X	X					X	X								4
RC18																	0
RC19					X					X			X	X	X		5
RC20	X	X		X	X	X				X	X		X	X			9
RC21	X	X	X					X	X	X	X		X	X			9

RC22	X	X			X	X	X	X	X	X	X		X	X			11
RC23	X	X			X			X		X				X			6

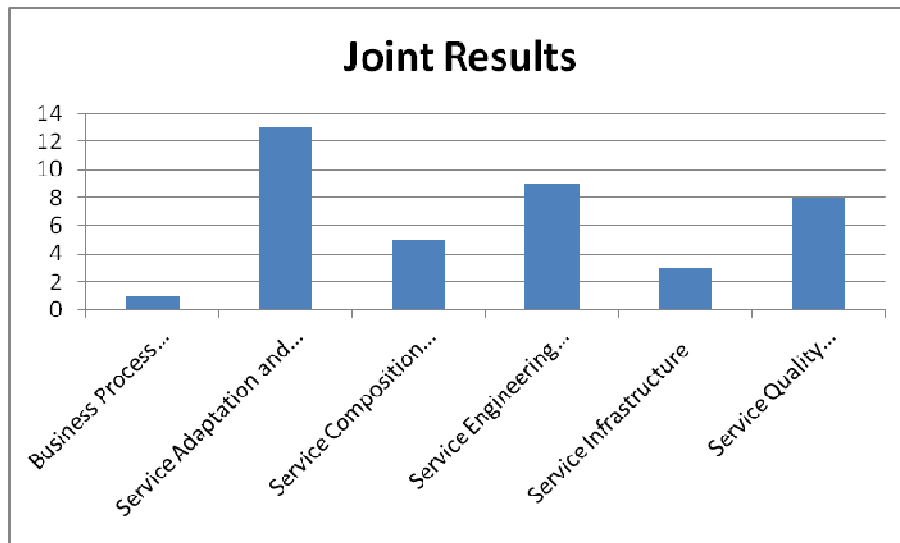
A7. Coverage of Research Questions of the Beneficiaries with the Research Results

The following chart demonstrates how many research questions the beneficiary is working on are already covered by the research results provided by this beneficiary.



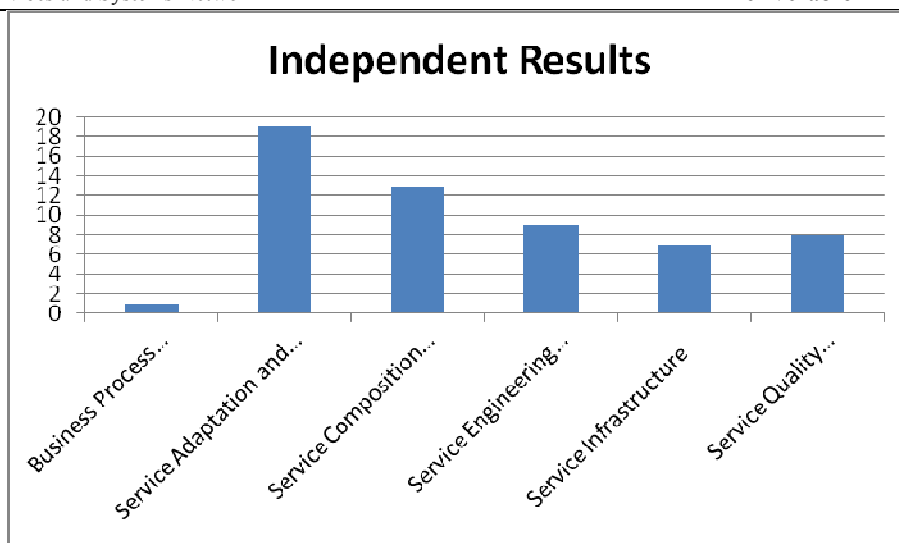
A8. Coverage of Research Areas by Joint Research Results

The following chart demonstrates the distribution of joint research results across the S-Cube research areas.



A9. Coverage of Research Areas by Independent Research Results

The following chart demonstrates how many research results are obtained by the beneficiaries independently from the others in each research area.



A10. Coverage of Research Areas by Competences of the S-Cube Beneficiaries

The following table represents the coverage of the research areas with the competences of the individual beneficiaries. The mapping is obtained from the analysis of the competences represented in Annex A2.

S-Cube Beneficiary	SED	SAM	SQDNA	BPM	SCC	SI
UniDue	X	X	X			
Tilburg	X		X	X	X	X
CITY	X	X				
CNR		X				X
FBK	X	X	X	X	X	
INRIA	X	X	X			X
Lero-UL	X		X	X		
POLIMI	X	X	X		X	
SZTAKI		X				X
TUW		X	X	X	X	X
UCBL		X	X	X	X	
UOC			X	X	X	
UPM			X	X	X	
USTUTT		X	X	X	X	X
UniHH		X		X	X	
VUA	X					
Total	8	10	11	9	9	6

A11. Coverage of the Competences with the Research Results

The following table aims to show how the competences of the individual beneficiaries evolve through the project. Specifically, it shows the number of research results obtained by the beneficiary in the research area and how this correlates with the competences of the beneficiary. For the areas, in which the beneficiary declared the competences it show the number of results obtained. If there are results in the areas not reported by the beneficiary as an area of competence (i.e., the new competences), the number of results is marked with “+” sign.

S-Cube Beneficiary	SED	SAM	SQDNA	BPM	SCC	SI
UniDue	3	4	5		+1	
Tilburg	3	+5	1	0	0	0
CITY	6	9	+3			
CNR		0			+1	1
FBK	6	7	4	0	1	
INRIA	0	2	2		+2	2
Lero-UL	1	+2	0			
POLIMI	7	7	2	+1	1	
SZTAKI	+1	2	+2		+1	3
TUW	+3	5	2	0	3	3
UCBL	+1	3	3	0	0	
UOC	+1		1	0	1	
UPM	+1	+3	4	0	3	2
USTUTT	+1	7	2	1	6	0
UniHH		0		0	2	
VUA	1	+2				

A12. Coverage of Research Areas by Competences of the Associated Members

The following table shows represents the coverage of the research areas with the competences of the associated members. The mapping is obtained from the analysis of the competences represented in Annex A2.

Associated member	SED	SAM	SQDNA	BPM	SCC	SI
Manchester Business School					X	X
STI Innsbruck					X	
Universitat Politecnica de Catalunya (UPC)	X					
University of Dortmund			X			X
University of Lugano					X	X
Total	1	0	1	0	3	3