PROJECT PERIODIC REPORT

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Date of latest version of Annex I against which the assessment will be made:

Periodic report: **1st** ☐ **2nd** ☐ **3rd** ☐ **4th** X

Period covered: **from 01/12/2016 – 30/11/2017**

Name, title and organisation of the scientific

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

Declaration by the scientific representative of the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) [3]:

  ☐ has fully achieved its objectives and technical goals for the period;

  X has achieved most of its objectives and technical goals for the period with relatively minor deviations.

  ☐ has failed to achieve critical objectives and/or is not at all on schedule.

- The public website, if applicable

  X is up to date

  ☐ is not up to date

- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 3.2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: Prof. Dr. habil. Alois Knoll

Date: January, 29th 2018

Signature of scientific representative of the Coordinator

[3] If either of these boxes below is ticked, the report should reflect these and any remedial actions taken.

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1. Publishable summary

With the project reaching the fifth year of its lifetime, ECHORD++ (E++) is fast approaching a gradual, yet profound transition. The central focus of activities finds itself progressively shifting from chiefly technical developments, to result extraction and exploitation. From doing to looking back, reflecting, and learning. A process of literal introspection; looking within the project, reflecting upon its achievements and shortcomings, to learn, grow, and prepare the future of Technology Transfer in Robotics in Europe.

While this transition towards exploitation is indeed underway, significant volume of technical activities were still undertaken during the Reporting Period (RP). In the Experiments Instrument, Call 1 Experiments concluded at the onset of the RP, whereas all sixteen Experiments from Call 2 were active throughout the period. Outcome of final evaluations for Call 1 was very positive, denoting strong scientific and technical achievements across the board. More interesting yet, products and services developed are finding their audience. The process of successfully bringing robotic innovation onto the market is a long and perilous one. Only a select few, the most precocious Experiments of Call 1, have reached that milestone. There are clear signs however, that they are soon to be followed by a progressively wider selection of their Call 1 and Call 2 peers. Still, on the strength of these select few alone, compounded sales of robotic products designed, prototyped, or developed in Call 1 have reached the seven figure range for 2017. This total is expected to steadily grow in the coming years.

To support this growth, and in particular to further assist Experimenters on their way to market, E++ Core Partners have taken the initiative to implement a novel programme, complementing support offered by the Experiments Instrument (itself devoted to Technology Transfer and technological development). This Experiment Booster Programme was designed to provide the specific assistance useful to supported Partners in reaching market, on a case-by-case basis. Possible support offered includes any relevant combination of product qualification, product industrialisation, market analysis, business planning, and beyond.

Volume of technical activities undertaken at the three E++ Robotic Innovation Facilities (RIFs) has remained steady throughout the period, with a constant stream of engagements. As the RIF network matures, close technical collaborations between the RIFs have developed on topics of special relevance to their target audience (in particular, Small and Medium size Enterprises, SMEs). RIF partners are engaged in continuous discussions, reflecting back and learning from their shared experience, with an eye to the future. This concertation is intended to further improve quality of services offered to beneficiaries in general, and SMEs in particular. It also plays a central role in informing the RIFs' plans towards a sustainable future beyond E++.

Tremendous growth was observed in the Public end-user Driven Technological Innovation (PDTI) Instrument. Both consortia competing in the Urban Challenge successfully completed the prototyping Phase and are moving on to the Small Scale Test-series Phase. Reviewers praised the growth in technological maturity displayed by both developed systems. The prototyping Phase is still ongoing in the Healthcare Challenge, but progress shown by both teams has been particularly well received by evaluators and stakeholders alike.

Efforts expanded in dissemination and outreach have, over the RP, reached an unprecedented breadth. In complement to E++ presence in professional fairs and trade shows, significant efforts were invested in reaching out to high-profile press in the form of a VIP Press Tour, held in combination with the Interna-

tional Robotics Festival, organized in September 2017. The event afforded the invited press special insights into the mechanics and processes driving Robotics Innovation and Technology Transfer in Europe. Direct outreach collaborations, with contemporary projects in robotics Technology Transfer, have been undertaken under the common umbrella of the Common Dissemination Booster Programme. Looking to upcoming events, E++ will have a strong presence at automatica 2018 (in Munich, June 2018), with a 150sqm stand, cementing ECHORD++ as the prominent, best recognized brand in Technology Transfer for automation and robotics in Europe.

2. Project objectives, work progress and achievement, project management

All three Instruments within E++ saw significant activity within the Reporting Period (RP). In the Experiments Instrument (WP3), Call 1 concluded around the end of the previous Reporting Period, whereas all sixteen Experiments in Call 2 were active within this current RP. RIFs (WP4) have continued technical operation throughout the period, and all RTD consortia in PDTI (WP5) have been active. Specifically, in the Urban Challenge, the prototyping phase (Phase 2 out of 3) was successfully concluded, with both consortia moving on to Phase 3. Proceedings within the Healthcare Challenge (HC) were delayed to some extent, the result of issues discussed in the previous Periodic Report. Phase 2 for HC began in June of 2017 and is set to come to a conclusion by the end of March 2018 (beyond RP4).

2.1.1 Project objectives for the period

Hereafter, we discuss the specific objectives for the project's different work packages, both over the overall project duration, but also specifically for the Reporting Period 4.

Overall Objectives WP1:

WP1 covers the project management, the financial management, as well as the quality management of E++ and, importantly, the management of Amendments. More precisely this means:

- Efficient coordination of the integration of all the work packages using an up-to-date communication infrastructure in a collaborative environment;
- Establishment of the management infrastructure for the efficient operation of a complex project comprising a variety of different instruments;
- Efficient collaboration within the consortium, especially between the project committees;
- Timely communication with the European Commission;
- Quality assurance of the technologies employed and the services offered, and a proper implementation of the work packages, including the timely delivery of deliverables;
- Efficient control of the budget.

Fourth reporting period:

The major objective of the fourth reporting period was to coordinate the progress of all the activities geared to the RTD instruments of the project. Two experiments of Call I and all the experiments of Call II were running and under monitoring. The consortia selected at the end of PDTI Phase I for urban robotics went through Phase II of prototypes development and a successful onsite review. Also the consortia involved in PDTI healthcare ended Phase II and prepared to go through the onsite evaluation, which will take place at the beginning of the next reporting period. All the RIFs were invested in their operational

phase. During the tracking of the performance of all the instruments, the cost claim for the previous reporting period, one amendment for the funding of PDTI Phase II, and its pre-financing were successfully carried out.

Overall Objectives WP2:

WP2 encompasses the external and internal communication of E++ as a whole and provides service and material for the "scientific" work packages (WP3, WP4 and WP5). It supports the preparation of high-quality information material (e.g. templates, pictures, graphs, and statistics) for WP6. The objectives of WP2 can be described in further detail as follows:

- To ensure effective support of all stakeholders involved (or even just interested) in the project
- To realise effective external communication with representatives of the media (professional press, daily press, TV channels, etc.)
- To communicate with the general public, comprising policy makers as well as the stakeholder groups represented within the project (RoM[4], ReIO[5], public bodies, students, decision-makers in politics, trade associations, etc.)

Fourth reporting period:

The objectives for the fourth reporting period were highly influenced by the recommendations given in the third review report. In particular, it was our goal to:

- Develop and execute an aggressive marketing strategy
- Make an attempt to secure pieces in quality business press in relevant countries
- Communicate the results of ECHORD++ regarding the technology developed but also the project's methodology
- Finalise the RIF corporate video and the 360 degree tours

Overall Objectives WP3:

This work package covers the management of the experiments: from the cradle (the management of the Open Calls and selection of the experiments), via the life time (monitoring of their activities based on Performance Indicators), throughout to the end (measurement of impact directly after the runtime and for a certain time after their official end for the sake of sustainability). The DOW describes the objectives as follows:

- To evolve the regulatory framework governing the experiments;
- To implement and continuously improve the processes for the experiments in close cooperation with the Quality Management based on the experiences of ECHORD.

Fourth reporting period:

Activities conducted revolved around two main axes; 1) Finalising reviews of Call 1 Experiments and begin work on exploitation, and 2) monitoring of Call 2 Experiments and preparation of reviews. A majority of Call 1 reviews (9 out of 15) were conducted within RP4, the last one, for EXOTrainer, occurring in May 2017 (project delayed to allow clinical trials during the Experiment's runtime). Exploitation for Call 1 has begun in terms of opening discussion channels with the Experimenters, and finding out from them what

[4] Robot Manufacturer(s)

[5] Research Institution(s) and/or Organisation(s)

has been the outcome, and in what manner it is impacting their activities going forward. In complement to this, core consortium members have also kick-started the Experiment Booster Programme during RP4. Selection was performed in late November, while the program itself will be active in the next RP. Monitoring of Call 2 has proceeded smoothly, with a tight coordination between involved partners under the governance of the WP3 leader, SSSA. Preparation of Call 2 reviews is underway. At time of writing, the first reviews have been scheduled, and all Experiments have been assigned an external expert for the reviewing process (with a few exceptions). Due to a number of extensions, the Call 2 Experiments will conclude at the end of June 2018.

Overall Objectives WP4:

The activities within WP4 were geared to the development of the entire management process for the RIFs (Robotics Innovation Facilities). This process covers the purchase of equipment (to complement the in-kind contribution hardware-wise provided by all three RIF owners), the application and selection process for potential RIF users, the definition of Performance Indicators to track the success of the stay during and after the use time, the remuneration procedures, etc. In detail this amounts to:

- Define all the processes needed for RIF set-up, operation and evaluation;
- Provide networking opportunities to partners undertaking E++ Experiments;
- Provide opportunities to educate and support a new generation of entrepreneurs in robotics;
- Make available the physical and human resources to support commercial exploitation, especially for SMEs and startups.

Fourth reporting period:

The main objectives of the fourth period, from our last review are the consolidation of operation of RIFs, extending the inter-RIF collaboration and developing interaction with the System Integrators.

Overall Objectives WP5:

WP5 is dedicated to the development of robotics technology for the public service in two pre-defined application domains: *Urban robotics* and *Healthcare*. Subsequent to the definition of the overall scenarios, the concrete challenges (one per scenario) are identified via an Open Call addressed to public authorities (hospitals, municipalities etc.). These two challenges build the basis for an Open Call to which RTD consortia can apply in order to develop the technologies in a competitive approach (three teams per scenario in Phase I, two out of these three teams competing with each other in Phase II and Phase III). This technology development is guided by the public authorities which have submitted the successful PDTI challenges. This process can be illustrated as follows:

The overall objectives of WP5 can thus be described as follows:

- To define concrete potential application areas for pre-commercial procurement (PCP) in robotics in the public sector, geared to the societal challenges identified for HORIZON 2020
- To establish, prototype (PCP pilots), evaluate and document a process to identify innovation gaps for the public sector based on an active search for public bodies to join the project
- To push the development of specific products for the public sector in a competitive way and to cooperate with the Quality Management
- To showcase the benefit of robot technology in selected applications with real installations in target environments

- To develop robotic solutions that meet the end-user requirements

Fourth reporting period:
Within the Urban Challenge, the Reporting Period essentially coincided with Phase 2 (prototyping). The activity for this Challenge were tightly monitored, deliverables evaluated, and the final evaluation was conducted in October of 2017 in Barcelona. In the Healthcare Challenge (HC), official start of technical activities by the RTD consortia was delayed to June of 2017, following adoption of the corresponding amendment (Amendment V) as discussed in WP1. Activities in PDTI-HC has also revolved around monitoring of the prototype phase, and preparation of the Phase 2 final evaluation, to be held in Barcelona in late February 2018.

Overall Objectives WP6:

WP6 is dedicated to increasing the visibility of ECHORD++ via conferences and fairs and to disseminating the scientific results of the project. To achieve these goals ECHORD++ can rely on a speaker group set up to present E++ at different events.

The goals in detail are:

- To increase the visibility of ECHORD++
- To organise the structured dialogue
- To develop and sustain external relations with all stakeholders involved: public bodies, partners, science communities and the general public, comprising policy makers, trade organizations and public users
- To present ECHORD++ at relevant, selected events
- To support the instruments experiments (WP3), RIFs (WP4) and PDTI (WP5) in attracting users/customers and in delivering the results to relevant stakeholders

Objectives for the fourth reporting period
During the fourth reporting period also WP6's objectives were strongly influenced by the reviewer's recommendations, in particular concerning the communication of the project's results concerning the technology developed but also the project's methodology. As before, there has been a strong collaboration between the partners driving WP2 and WP6 to ensure that the objectives are met.

2.1.2. Follow-up of previous review

The consortium gratefully acknowledges the help and support offered by the reviewers. Insights provided have been invaluable to us in our work. Hereafter, we discuss the manner in which reviewers' recommendations, as formulated in the Technical Review Report for Period 3, have been addressed.

Recommendation R1: *Consider how to best materialize and communicate the general learnings of the project as a whole.*

Work performed within E++ has two central objectives, the first of which being to achieve Technology Transfer (TT), bringing robotic innovation to market. The second, and equally important objective, is to further our, and the community's, understanding of what works and what does not work when trying to achieve TT in robotics. Bringing robotics innovation to market is a complex, challenging proposition, for

which there does not exist any ready-made recipe for success. E++ actively explores, with its three Instruments, different avenues to provide the support, environment, and conditions that can allow such success. Insights achieved from this experience however, can only prove beneficial if they are disseminated to the relevant audience. Hence, communicating lessons learned in E++ is one of our core concerns, and an aspect we invest significant resources and efforts in.

Measures to communicate this knowledge were foreseen at the project's onset, with in particular four white papers, intended to disseminate best practices in the areas corresponding to the three E++ Instruments, specifically: Financial Support to Third Parties (FSTP) based on our experience and corporate knowledge in Experiments, networks of Competence Centers (CCs) based on insights gathered from RIFs, and co-creation with public end-users, from the work performed in the Public end-user Driven Technological Innovation (PDTI) Instrument. Building upon the analysis conducted within these white papers, an article[6] was recently published discussing the PDTI process. Further, to directly engage the robotics community on these topics, two Workshops are being organized for the upcoming European Robotics Forum (ERF, March 2018 in Tampere, Finland). The first one, "From Technology Transfer Initiatives to Digital Innovation Hubs," will be held jointly with our partners and colleagues from ROBOTTT-NET. The intent of the workshop consists in sharing with the audience insights gathered from these two Robotics Innovation and Technology Transfer projects, in particular in the perspective of the creation of Digital Innovation Hub (DIH) networks in the near future. In this Workshop, insights gathered from all three E++ instruments will be discussed. The second Workshop, "Encouraging Regions to Innovate through Robotics," is organized by the E++ Core Partner UPC. The focus there is on engaging public bodies in the technological innovation process, hence insights from the PDTI Instrument will be of great relevance, but RIF partners will also contribute to the discussion, presenting lessons learned within the RIF Instrument. This ERF provides a particularly interesting venue for dissemination, providing the exact audience that may best benefit from information shared. But in addition, this information is of special relevance to the upcoming development of DIH networks. The information provided in both of the above Workshops is both topical and timely, and we expect a significant turnout. In complement to this, the consortium is pursuing additional opportunities for talks and presentations on the topic, in particular at trade fairs attended. One such event is for instance in preparation for the upcoming automatica 2018, and will provide an opportunity for the consortium to address and reach out to an audience with a stronger industrial leaning. Within the reporting period itself already, the consortium has engaged audiences on these topics in a variety of events, including at the "Smart Regions with Smart Robots: A Winning Formula" meeting in Brussels (May 2017), "Hubs, Platforms and Pilots in Horizon2020: For Clusters, Companies, Researchers," in Oslo (September 2017), and the "Workshop on financing and sustainability of Collaboration Networks," in Brussels (October 2017).

In addition to the joint organisation of the aforementioned ERF workshop, the core consortium has been actively engaging institutes involved in other Technology Transfer projects in several different capacities, with the recurring, shared objective to pool together insights from these different projects. Among other examples, we are involved with partners from, among others, HORSE, RobMoSys, ReconCell, and ROBOTT-NET, within a Common Dissemination Booster Programme. Further, we are directly engaging experts from some of these sister projects, involving them in some of our evaluation-related activities (e.g. see the TRL

[6] Puig-Pey, Ana, Yolanda Bolea, Antoni Grau, and Josep Casanovas. "Public entities driven robotic innovation in urban areas." *Robotics and Autonomous Systems* 92 (2017): 162-172.

Workshop discussed in R4). By including these experts within our evaluation processes, we of course benefit from their experience and the know-how they bring. But conversely, involving them within our processes, in particular in the explicit role of exploring and assessing the outcome from some of our Instruments, we provide them with exposure to our practices, in direct relation with their resulting outcome. Better than sharing best practices, this engagement process stimulates critical discussions, leading to a refinement and better understanding of what these best practices concretely are.

The E++ dissemination team has also directly reached out to organisations and institutes identified as having a direct stake in the type of process and practices implemented within the E++ Instruments, as detailed in Section 2.2.2.

Finally, end-of-project events and publications will have a strong focus on communicating lessons learned within the project. In particular, UPC is leading the edition of a special issue in Springer Tracts in Advanced Robotics, within which special emphasis will be afforded to the outcome of the three E++ Instrument and insights gathered therein. The end-of-project event will share a similar orientation, with seminars on best practices in robotics innovation and Technology Transfer, both from E++ consortium member and distinguished invited speakers.

Recommendation R2: *Develop and aggressively execute a marketing strategy clearly defining the ECHORD++ outputs' value proposition (RIFs and PDTIs) to customer segments (system integrators, but also start-ups, students, public etc.) thereby defining their place in the value chain. Include an attempt to secure pieces in quality business press in relevant countries (Financial Times, il Sole 24 Ore, L'Express, Der Spiegel / Handelsblatt or similar), using a PR agency as necessary.*

Following the reviewer's recommendation, partners leading communication and dissemination jointly organised a meeting, June 20th in Munich, in which representatives from all three Instruments were invited. The purpose of the event consisted in assessing our current communication strategy and analysing the need for, and manner to, refine it. We jointly defined the marketable products emerging from the project, the key stakeholders for these products, and our objectives for interacting with these stakeholders. We, in addition, defined the message which we intend to convey to the stakeholders, the actions required to deliver this message, achieve the aforementioned objectives, as well as the measures best able to quantify success. Some of the actions taken have been discussed in R1.

A number of initiatives were taken in synergy with the International Robotics Festival (Pisa, September 7-13th 2017). During the festival, the RIF@Peccioli hosted a delegation of selected international science, technology and business journalists, from high-profile publications, for a day-long programme. This media tour was jointly organised by TUM and SSSA. Carefully selected journalists from European high-level consumer and trade press (including representatives from all media mentioned in the recommendation) were invited to the event. Organisational aspects, in particular as it pertains to reaching trade press, were supported by the press offices of TUM and SSSA, with additional help from local agency ASTI Incentives & Congressi.

As discussed in Section 2.2.3, RIFs have been particularly active during the period, specifically on aspects relevant to their longer-term sustainability. Naturally, the central preoccupation consists in analysing, among offered RIF services, what is the value proposition most susceptible to generate income in the future. In other words, what services can be made paid-for-services, and who are the target customers? Following suggestions from the reviewers, RIFs have extended and strengthened their relationships with

System Integrators (SIs). On the occasion of the aforementioned Robotics Festival, for instance, personnel from the RIF@Peccioli reached out to a selection of robotics SIs from the Tuscan area, firmly placing the RIF network on these SIs' radar as a potential partner of interest. Similarly, the RIF@Paris-Saclay is extending its connection to SIs, both through the involvement of CEA in a number of initiatives, such as the Integration Platform FFLOR and the upcoming digital technology pole Digihall, but also through direct technical collaborations with SIs, such as for instance with GEBE2. RIFs are also exploring the perspective of offering due diligence services to investors. In particular, the RIF@Bristol has developed a close, well-defined collaboration with the NatWest investment bank, providing expertise to inform investment decisions. This symbiotic relation, between RIF, investor, and SME, is of benefit to all actors involved. The SME receives informed feedback on the investment opportunity they present to the bank, and possible technical support from the RIF. The investor receives expert information useful to assess risk, and the RIF develops relationships both with SMEs interested in robotics and potential investors. All three RIFs are actively collaborating and sharing information on such aspects, pooling together their knowledge of relevant SIs, and sharing insights on how to approach investors and possibly develop due diligence services. At this stage, the RIFs have outlined a draft of their business plan beyond runtime of E++. This plan finds itself regularly adjusted and refined to reflect findings gathered from continuous operation of the RIFs. In addition, the RIFs are in contact with Core Partner BOR, whose Investment and Funding Department may provide assistance in further improving those plans.

Recommendation R3: *After further rapid analysis consider how to best support experiments through a Booster program focusing on Business Development training and perhaps based on which experiments will most benefit, and quick to implement since time is short.*

Core partners have moved forward with the Experiment Booster programme, as discussed in further detail in Section 2.2.2. Experiments from both calls were first approached in August, interest was received from a half dozen of them. Selection of beneficiaries was performed by issuing a (very simple) call for (one-page) proposals. That call was open from November 7th to November 15th, 2017. Six proposals were received, four of them were supported. Three of these are from Call 1, one from Call 2. Out of the four, two of them will come to Munich, to work with UnternehmerTUM. The two others will work will local service providers, in Eindhoven and Zurich. Booster activities will take place between February 2018 and January 2019.

Recommendation R4: *please re-examine the TRL step changes claimed by the experiments, especially those that claim a starting point of TRL1 or 2, in order to better align with existing practice and thus to obtain maximum credibility and impact when presenting outside the project.*

Evaluation of Experiments TRL will be performed by external experts. Concerning Call 2, TRL evaluation will be expected of the external expert acting as reviewer. The expert, on the occasion of the review, will have direct access to the prototype developed, see a demonstration of the technology, and have direct access to the Experimenters having developed it. The information will allow the expert to assess both initial TRL, based on information contained in deliverables, the Experiment proposal, but also the Experiment's KPI document, which describes the starting point of each experiment from a technological point of view. Final reports, and the prototype demonstration at the review will allow the expert to assess TRL at the conclusion of the Experiment.

The same, although a posteriori, assessment will be performed for Call 1 Experiments. To that end, an "E++ Experiments TRL evaluation Workshop" will take place in Munich, on January 30th 2018. On that

occasion, a number of experts will meet, assess available information, and provide their best estimate of the start and end TRLs. Experts invited include Call 1 reviewers (Prof. Andreas Müller from JKU Linz, Dr. Patrick van der Smagt, Director of AI Research at VW), who have a sound understanding of the project's spirit and scope, and first-hand experience with a number of the Experiments under consideration. In complement, expertise from other robotics innovation projects will be included in the person of Thilo Zimmermann, from Fraunhofer IPA, involved in SMErobotics and ROBOTTT-NET.

2.2 Work progress and achievement during the period

The following section gives an overview of the progress achieved by the core consortium in the different Work Packages. WP 1 is identical with the Project Management and is therefore dealt with under section 2.3. of this report. The progress achieved by the partners selected under the first call for RTD experiments is provided in Annex I.

2.2.1. Work Package 2: Service Center

During the fourth reporting period the Service Centre invested the major part of its resources in promoting the project and its results among the relevant target audiences. The main achievements in WP 2 during the fourth reporting period were

- Significantly expanded presence in the media
- VIP press tour through the RIF in Pisa-Peccioli with invited journalists
- Active "selling" of the ECHORD++ methodology
- Successful application for the Common Dissemination Booster Programme
- Publication of the RIF corporate video and the third 360 degree tour

Task 2.1: Everyday work

The everyday work consisted of assisting experiment and PDTI partners via email and telephone, providing general and specific information about the project to interested stakeholders and enabling communication among the core consortium partners. Moreover, the Service Centre has processed a couple of requests from journalists who wanted to cover the project in the media and needed an appropriate contact person.

An anonymous customer satisfaction survey among the experiment partners from call two (cf. deliverable 2.1.4) showed positive feedback for the support by the ECHORD++ consortium regarding the personal interaction with the monitoring team, the financial management team and the project's administration. Also, the experiments' kick-off meeting in Palma de Mallorca was widely appreciated by the participants, the session on public relations during the kick-off received positive feedback as well. Interestingly, the newly introduced question "does your organisation have a PR department supporting your PR activities?" revealed that almost half of the participants could not rely on the support from an internal PR department, thereby underlining the need to receive support and guidance from the core consortium in questions of public relations.

The feedback received for the project's website and the social media channels was also quite positive, regarding the portal, though, a couple of users reported issues with the usability (cf. Task 2.2).

Task 2.2: Provider of the IT-infrastructure

Since no new functionalities were scheduled for development, the focus in task 2.2 lay on the maintenance of the existing IT-infrastructures coupled with minor bug fixing. However, the results of the customer satisfaction survey mentioned above indicate room for improvement regarding the monitoring platform's usability. The expressed concerns were taken seriously and fed the discussion about the further development of the call management and project monitoring platform. Major improvements were scheduled which could be implemented in the current version of the platform now being used by other projects like HBP, HORSE and RobMoSys. After long consideration, the question whether to implement the updated version in ECHORD++, too, had to be answered negative, though. This decision was made because the cost-benefit ration of the implementation would be unfavourable. First, because the version being used by other projects has significantly evolved compared to the one used in ECHORD++, therefore a complete migration of the content to the new version of the platform would be necessary, requiring a large effort in terms of project staff's time and probably also direct costs of the web agency. Second, because the experiment monitoring is coming close to the end, the resources needed to adapt the monitoring to the new platform would only be beneficial for a very small amount of project partners and therefore be unjustified.

Task 2.3: Planning of communication measures for all WPs

The communication plan and strategy developed in the early stage of ECHORD++ was and is being revised and adapted according to the strategic objectives of the project's communication. For the fourth reporting period the development of the strategy was highly influenced by the recommendations from the third review report.

As soon as the report was available in written form, TUM and UPC initiated a physical meeting to discuss all topics related to dissemination, communication and marketing which took place on 20th June 2017 in Munich. Detailed minutes of the meeting are available upon request, of course.

Following the reviewer's recommendations we have assessed our current strategy and analysed the need for refining it. We have defined the marketable "products" emerging from the project, the key stakeholders for these products and our objectives for interacting with the stakeholders. Furthermore, we have also defined the messages which should be sent to the stakeholders, the actions for realising the objectives and the measures of success.

In the area of "methodology selling" representatives of ECHORD++ have presented the project's methodology at four major events: first, the "Smart Regions with Smart Robots" event, taking place on May 10 in Brussels. Paolo Dario, Chris Melhuish, Alberto Sanfeliu and Christophe Leroux presented the "RIF methodology" to representatives from local, regional and national authorities. Second, on September 14 Geoff Pegman followed an invitation of the Research Council of Norway to share know-how from ECHORD++ with potential applicants for DIHs from Norwegian industry and academia at an event named "Hubs, Platforms and Pilots in Horizon 2020". Third, upon recommendation of the EC Marie-Luise Neitz has been invited to a workshop in Brussels on "financing and sustainability of collaboration networks". Fourth, at the central event of European Robotics Week 2017 (November 20, Brussels) Ana Puig-Pey and Franziska Kirstein presented the PDTI methodology to representatives from local, regional and national authorities from the European Committee of the Regions.

Further events like the ones mentioned above are already planned, for example a workshop at the European Robotics Forum 2018 on “Development & Learning from Technology Transfer Initiatives towards Digital Innovation Hubs”, co-organised by the projects ROBOTT-NET and ECHORD++.

Apart from participating in events, the consortium has also directly contacted nearly 20 organisations and projects offering to share the ECHORD++ methodology with them to spur further innovation and technology transfer. For this task the consortium could benefit from the help of TUM’s liaison office in Brussels using its network to promote the project and to find appropriate contact persons. With a couple of organisations promising first contacts were established. Among them is the European Association of Research and Technology Associations (EARTO) which is interested in sharing ideas and know-how regarding the management of cascading funding. The European Regions Research and Innovation Network (ERRIN) has expressed interest in organising a common healthcare-related event. The robotics institute of ITMO University St. Petersburg has visited TUM’s premises in October with the goal to learn more about ECHORD++ and is highly interested in future collaboration.

Despite the notable and highly appreciated support by DG Connect, unfortunately active participation in some very promising events for selling the ECHORD++ methodology has eventually been declined by other responsible branches of the EC. In particular this concerns the I4MS event in Madrid (22nd September), the Conference on Innovation Procurement in Tallinn (17th and 18th of October) and the general assembly of the Enterprise Europe Network (22nd – 24th November).

In August 2018 a portfolio of projects led by ECHORD++ has successfully applied for the Common Dissemination Booster (CDB) Service. The CDB is a brand-new service from the European Commission which is free of charge and available to all, ongoing or closed, European, National, Regional funded Research & Innovation (R&I) projects (H2020, FP7 or other). The booster encourages projects to come together to identify a common portfolio of results and shows them how best to disseminate to end-users, with an eye on exploitation opportunities. The CDB is provided on behalf of the European Commission by Trust-IT Services, a UK firm specialised in analysing and marketing Information and Communication Technologies across Europe and globally. The service starting in January 2018 will provide ECHORD++ and the other members of the project portfolio not only with additional ideas and means on how to maximise the impact of our dissemination, but also offer the opportunity to explore synergies between the projects on an unprecedented level.

On September 12th, the RIF in Pisa-Peccioli hosted a small delegation of international science, technology and business journalists for a day-long programme that included an exclusive guided tour through the ECHORD++ Robotics Innovation Facility (RIF) in Peccioli and the external facilities at the Floriddia Biofarm in Pontedera. The media tour was planned by TUM and SSSA in conjunction with the International Festival of Robotics taking place in Pisa from September 7th to 13th, with a series of events and exhibitions in more than 11 locations throughout Pisa.

Figure 1Media Tour in Pisa from left: Farid Dailmai (RIF Coordinator, Bristol), Francesca Cecchi & Collegue (SSSA), Daniel Villanueva (El Pais, Spain), Kassie Perlongo (Robohub), Marie-Luise Neitz (Project Coordinator, TUM), Adriana Hamacher (Freelance Robotics)

Carefully selected journalists from European high-level consumer and trade press have been invited to the event with the help of the press offices of TUM and SSSA and with organisational support by the local agency ASTI Incentives & Congressi. In the aftermath of the event we have analysed the contacts with the media and their reaction to the event resulting in the confirmation of two lessons learned throughout the project: first, the media would like to see real robots "in action" above anything else. Second, mostly special interest media related to topics covered by the experiments/PDTI consortia and local/regional consumer press are interested in receiving news from ECHORD++, whereas larger, national media are usually more reserved towards our project.7

Therefore, we have successfully continued with expanding ECHORD++'s vast presence in media relevant to our target audiences. This presence has notably evolved since the end of the 3rd reporting period. In total, by the end of November 2017 the project has triggered 285 references in the media from which around 60% had their source in activities by the experiment/PDTI partners. These figures show the direct success of our strategy to enable the beneficiaries of the cascading funding to build fruitful media relations, turning them not only into spokespersons of their own projects but also of ECHORD++ as a whole.

Hence, like for the experiments from both calls TUM created for each of the PDTI projects a collection of associations, conferences and trade fairs as well as press and media information, directly tailored to the

[7] In fact, some media have also shown an openly dismissive attitude when asked to spread the news about ECHORD++, for example the "Economist's" editorial staff stated that they "would not cover something like that" (meaning ECHORD++).

demands of the PDTI projects' communication plans. These so-called "PR references" have then been discussed with each of the projects in telephone conferences. Both, the channels mentioned in the proposals and the then selected channels from the PR references documents were merged into a communication plan for each PDTI project. Those plans have been integrated into the monitoring for tracking and validating the progress of the PDTI consortia in terms of communication.

The project website was always filled with the latest information about the progress of ECHORD++ as was the LinkedIn group, which has grown to over 370 members (December 2017). For the ECHORD++ Twitter account we were able to notably increase the followership, reaching over 1,000 followers (+59%) in December 2017. Very good figures can also be reported for the Twitter accounts of the RIFs in Bristol (1,627 followers, +27%) and Pisa-Peccioli (474 followers, +28%).

Two newsletters were issued, one in February 2017, announcing the RIF corporate video and the appointment of Yannick Morel as scientific project manager of ECHORD++, the other in November 2017 announcing ECHORD++'s participation in the European Robotics Week and the Smart City Expo World Congress.

A press release was issued by the core consortium regarding ECHORD++'s presence at Hannover Messe. Besides naming the exhibiting experiments at our booth, we announced a RIF lucky draw at the ECHORD++

Figure 2 Lucky Draw at Hannover Messe and Postcard (front and back)

booth. The goal of this lucky draw was to attract prospective applicants for our RIFs and to collect more addresses. The prize of the draw was a 6-week RIF collaboration including travel costs up to 1.000€ at one of the three RIFs. We printed postcards with a shortened application form, which could be dropped into a RIF-labelled box. Around 30 postcards and business cards were collected, but only three of them were proper applications, and only one of which was serious. At the end we did not give away any prize. The newly collected addresses were added to our newsletter subscribers.

Task 2. 4: Maintenance of target-group specific data

The consortium is constantly expanding its network and establishing new contacts with relevant stakeholders in all fields covered by the project. Contact data bases are being updated as appropriate.

The press release distribution list built up in the first reporting period is also kept up to date and expanded as new contacts with the media are established.

Task 2.5: Generation of PR-related material

The existing design templates (PowerPoint, Word, flyer, roll-ups, poster) have been adapted to the project's progress and been used at various occasions. In addition, we produced an experiment brochure featuring all experiments from both calls. Currently in development is an industry-oriented publication with success stories from ECHORD++, highlighting particularly promising results from the experiments and PDTI as well as the methodology of the project and background information on the context of ECHORD++.

In February 2016 we publically released the RIF corporate video on the project's YouTube channel. Since then, we have also published several other videos and thereby significantly expanded our presence on this channel. After the difficulties with accessing the facility in Paris-Saclay were finally removed, a 360 degree video of the RIF in Paris-Saclay was produced and published, thus completing the series of 360 degree tours through the RIFs. All 360 degree videos have not only been published on YouTube but also on a new channel dedicated to omnidirectional videos named VeeR. There, our three 360 degree videos have already gained more than 6.000 views. Also, the multimedia reports from the call 1 experiments were uploaded to the YouTube channel and have found their audience.

For PDTI UPC has developed two videos, one explaining the methodology of PDTI and the other showing footage of the sewer inspection robots at the on-site evaluation after PDTI phase two. For 2018, Blue Ocean Robotics will produce a similar video for the PDTI healthcare challenge.

The pictures taken at the RIFs by a professional photographer have not only been used for the project's own publications, they are also in high demand by media featuring stories on the robots developed in ECHORD++ or the project as a whole.

2.2.2 Work Package 3: Experiments

WP3 includes most activities related to the Experiments Instrument, in which most of the efforts expanded during the reporting period pertain to monitoring of Call 2 Experiments, and result extraction and exploitation for Call 1 Experiments. These activities correspond to the two following tasks,

- **Task 3.5**: Phase V: Monitoring and Review (Call 2),
- **Task 3.6**: Phase VI: Result extraction and exploitation (Call 1).

Hereafter, we discuss these two tasks successively. No other task was active during the Reporting Period.

Task 3.5: Phase V – Monitoring and Review

As mentioned above, the overwhelming majority of work performed within the Reporting Period (RP) was done for Call 2 Experiments. However, a number of Call 1 Experiments were also active during the RP, due to extensions (LA-ROSES, EXOTrainer). Each Experiment has been concluded with a final review, on which occasion an external expert is invited to, together with the Experiment's Technical Moderator, get a hands-on demonstration of the technology developed, and discuss Experiment's achievement with the Experimenters (in particular in terms of KPIs, as tracked by the detailed traffic light system). Six of the

fifteen Call 1 reviews occurred in the previous RP (RP3, Experiments: DexBuddy, MODUL, MOTORE++, Pickit, SAPARO, and MARS), while the remainder occurred at the beginning of RP4. Most of these results were known by the time of the previous ECHORD++ review and presented on that occasion. Definitive results for Call 1 can be found in the monitoring deliverable D3.5.4. In a very short summary, most Experiments performed well-to-great, with a few exceptions (particularly DexBuddy and LA-ROSES).

All sixteen Call 2 Experiments were active during the entirety of the Reporting Period (RP). A small number of them concluded at the end of the RP; specifically DUALARMWORKER, INJEROBOT, and SAFERUN. Technical monitoring was active for all Call 2 Experiments over the duration of the period. The reviewing process for Call 2 began upon conclusion of RP and is ongoing at the time of writing.

General Monitoring Activities

Monitoring activities are structured around a Key Performance Indicator (KPI) roadmap. For each Experiment, Core Partners have negotiated with Experimenters one set of KPIs per Experiment. These KPIs are such that, their achievement by Experimenters guarantees completion of the Experiment's objectives, as originally described in the Experiment's proposal. The set of performance metrics is recorded in an official, agreed-upon by Experimenters document, referred to as KPI document. The monitoring process is then structured around timely achievement of these KPIs.

Each Experiment is overseen by a team of two dedicated Moderators, a Technical Moderator, comfortable with the technical content of the work done, and a Management Moderator, whose role consists in facilitating the monitoring process (scheduling Monitoring calls, taking minutes, etc.). These responsibilities were divided between Core Partners involved in WP3, in particular SSSA, UPC, and TUM. Hereafter you can find the detail of moderator assignment for Call 2 (Table 1). Interactions between monitoring team and Experimenters was performed through regular, two-monthly Skype monitoring calls, and follow-up question/answers through emails or infrequently over the phone.

Table 1 Monitoring assignments for Call 2, Moderators from SSSA in blue, from UPC in orange, from TUM in green.

Experiment	Technical Moderator	Management Moderator
AAWSBE1	SSSA - Manuele Bonaccorsi	SSSA - Manuele Bonaccorsi
CATCH	UPC - Herminio Martínez-García	SSSA - Raffaele Esposito
CoCoMaps	TUM - Adam Schmidt	TUM - Adam Schmidt
DUALARMWORKER	SSSA - Annagiulia Morachioli	UPC - Ana Maria Puig Pey Claveria
FASTKIT	TUM - Yannick Morel	TUM - Yannick Morel
FlexSight	SSSA - Raffaele Limosani	UPC - Ana Maria Puig Pey Claveria
GRAPE	UPC - Antoni Grau	SSSA - Stefano Betti
HOMEREHAB	TUM - Adam Schmidt	TUM - Adam Schmidt
HyQ-REAL	TUM - Yannick Morel	SSSA - Laura Fiorini
INJEROBOT	UPC - Antoni Grau	SSSA - Alessandra Moschetti
Keraal	SSSA - Abdul Butt	SSSA -Abdul Butt
MAX-ES	TUM - Adam Schmidt	UPC - Ana Maria Puig Pey Claveria
RadioRoSo	TUM - Y. Morel, UPC – A. Grau	SSSA - Clementina Cruceli
SAFERUN	TUM - Yannick Morel	UPC - Ana Maria Puig Pey Claveria
SAGA	SSSA - Alessandro Manzi	TUM - Yannick Morel
WIRES	SSSA - Ilaria Strazzulla	TUM - Adam Schmidt

The monitoring process is further supported by the online ECHORD++ platform, on which Experimenters are requested to upload deliverables and provide short status updates every two months, and on which the monitoring team can leave relevant written feedback for Experimenters.

Outcome of the monitoring process, in the form of traffic-light overview, is provided in the six-monthly deliverables D3.5.4 (April 2017) and D3.5.5 (October 2017). Each tracked category (Technical KPIs, Impact KPIs, deliverables, etc.) is assigned a traffic light value descriptive of status (good, acceptable, poor). In situation in which a given category is not in good standing (not green, but either orange or red light), a short explanation is provided by the monitoring team. Additional relevant comments, not necessarily fitting the strict KPI frame, are also included when useful. These monitoring deliverables provide a concise, high-level view of the state of Experiments in Call 2 at their time of writing. In complement to this, note that the monitoring team works at a greater level of detail. In particular, within each of the aforementioned broad categories, each item tracked (e.g. each separate KPI, each deliverable, milestone, etc.) is itself assigned a traffic-light value. The corresponding set of information, referred to as detailed traffic lights, is included within Quality Management (QM) reports, providing a more nuanced, but also significantly more expansive view of the situation. For RP4, these are D1.2.7 (March 2017) and D1.2.8 (September 2017). This two-layer approach allows the interested reader to first get an overview of the situation (monitoring deliverables D3.5.X), before deciding to then zoom in on whichever specific area appears to be of interest (finding specific, possibly problematic, set of KPIs for specific Experiments in QM reports D1.2.X). Monitoring results recorded in the above deliverables show that, with a few exceptions, status of Experiments in Call 2 is very positive.

Experiments Schedule Management and Extension Requests

A number of Experiments have approached the monitoring team to request a (cost-neutral) extension. Only two such extensions were granted in Call 1, while eight Experiments have made the request in Call 2. The discrepancy between Calls remains unexplained but is under discussion by the monitoring team.

Table 2 Extensions requested in Call 2.

Experiment	Expected end	Requested end	Motivations	Status
HOMEREHAB	Nov. 2017	Feb. 2018 (3 months)	Clinical trials	**Granted**
HyQ-REAL	Feb. 2018	June 2018 (4 months)	Delay in HW acquisition	**Granted**
SAGA	Nov. 2017	March 2018 (4 months)	Flight certification	**Granted**
WIRES	Nov. 2017	March 2018 (4 months)	Difficulty of integration	**Granted**
MAX-ES	Feb. 2018	June 2018 (4 months)	Final UGV delivered late	**Positive outlook**
Keraal	Feb. 2018	June 2018 (4 months)	Clinical trials	**Positive outlook**
FlexSight	Feb. 2018	June 2018 (4 months)	Dissemination	**Discussed**
CoCoMaps	Feb. 2018	June 2018 (4 months)	Delay in HW acquisition	**Negative outlook**

All requests are provided in Table 2. Grant of extension requests is assessed on a case-by-case basis. Some of the typical situations encountered include difficulty in timely scheduling of clinical trials (as is the case in Call 2 for HOMEREHAD and Keraal, was already encountered in Call 1 for EXOTrainer). A number of other situations were decidedly more specific to the Experiment in question. For instance, robot actuation in HyQ-REAL is performed by a new generation of custom-developed, 3D metal printed hydraulic Intelligent Servo Actuators (ISAs). The industrial partner, MOOG, has the expertise and the equipment to produce these ISAs. However, because the technology is very recent and in high demand within MOOG, the waiting time for access to the production line turned out to be greater than expected (high demand, low

production capacity). In another Experiment, SAGA, which makes use of drones to address precision agriculture issues, flight certification problems were encountered. To an extent that Experimenters ended up having to go through a redesign of the UAV.

The extension request process has been kept as simple as possible. Experimenters are requested to send a signed request letter to either WP3 leadership or project management, describing the problem they are encountering, and benefit to the extension. Assessment of the request is performed in concertation between the WP3 Leader and the project's Scientific Manager, after consultation of the Experiment's Technical Moderator. In the case that the extension is granted, the monitoring team negotiates an amended KPI document with the Experimenters (reflecting changes in the KPI achievement schedule), and project management notifies the Project Officer.

Management of Underperforming Experiments

As mentioned in a previous paragraph, most Experiments are in a very good status. A number of problems have however cropped up in a few of them, which has led to corrective measures. Monitoring conducted in ECHORD++ is very effective as a tool to detect deviations. In some instances, it can however return false positives, and there have been cases in which lack of (or problems in) communication from the Experimenter was misconstrued as a lack of efforts invested and of progress. In other instances, deviations were real and substantial. In either case, the situation is addressed first and foremost through discussion. The ECHORD++ online platform's overall status traffic light is used to signify to Experimenters that a significant issue is detected (red traffic light), and relevant written details are included as comment to provide clarity on the issue. A monitoring call is then scheduled rapidly thereafter, in which detected deviations are openly presented to Experimenters, explanations are requested, and Experimenters are reminded of their responsibility to pursue achievement of the KPIs described in the Experiment's KPI document. In a number of cases, what turned out to be communication problems are clarified. In situations where a significant deviation has occurred, a mitigation plan is negotiated between Experimenters and the monitoring team, with the expressed objective of ensuring the Experiment's outcome remains commensurate with commitments made in the original proposal, as quantified by the original KPI document.

Sharing of Best Practices in Monitoring

Core Partners take their monitoring and reviewing responsibilities very seriously, and efforts are invested in sharing best practices, as well as to ensure, smooth, homogeneous monitoring and reviewing quality across all experiments (which can prove challenging to the number of people participating in the process). Sharing of best practices is all the more important due to the turnover that has taken place in the ECHORD++ team in a number of partners. Regular events are held for Technical Moderator to provide a status update to the group about the Experiment(s) they are in charge of, but also to discuss procedures, problems, and tips, tricks, or insights they may have gleaned. One such monitoring call was organized in Spring 2017. An in-person meeting took place in Peccioli, with most of SSSA's and TUM's monitoring teams, in august 2017.

Task 3.6: Call I - Phase VI – Result extraction and exploitation

The original scope of this task was limited to assessment of Experiments' outcome. It has been expanded to provide additional support to Experimenters in the form of the Booster Programme. At the time of writing, only a select few Experiments from Call 2 have been concluded. Hereafter, we provide an overview of the outcome of Call 1 at this point in time, with a brief discussion of what information is already

available for Call 2. This outcome discussion is followed by a short presentation of the Booster Programme's scope and of selected beneficiaries.

Experiments Outcome

The core ambition of the Experiments Instrument is to bring robotics innovation *From Lab to Market*. Thereby, the main metric for success when looking back at the Instrument's outcome for Call 1 should likely be commercial success (i.e. sales). We will argue that this is a warped, partial perspective, but the exercise nevertheless provides interesting insights. Before looking at numbers, it is worth briefly addressing quality distribution across Experiment Calls. This distribution, regardless of metrics used to measure quality, appears fairly consistent across both ECHORD++ Calls, with a small numbers of excellent Experiments, an equally small number of bad ones, and the remainder in-between these two extremes, describing a Gaussian-looking curve. Measuring quality by commercial success, based on the information available to us at time of writing, only two Experiments have known any significant success (several others have registered sales, but for relatively modest amounts). However, that success has been fairly spectacular, with a combined volume of sales at about €1.3M for Call 1 over the year 2017. Compared to the investment in terms of requested funding (about €4.5M for the entire Call), this paints a very favourable picture (one year income at about 29% of initial investment). Of course, this overly positive picture is misleading. For one, it does not account for operational expenses, and therefore only reflects generated income. In addition, it only takes in consideration support extended within ECHORD++, whereas the more successful Experiments have (quasi-) systematically benefited from several different sources of support, including various combinations of national (public, research) funding, in-kind contributions from affiliated institutes, and private investments from industrial partners. Therefore, ECHORD++ support, while meaningful, usually only accounts for a fraction of the overall support received by Experiments. It would thus be unfair, or unbalanced, to look at the above investment (€4.5M) versus income generated (€1.3M) numbers from a strict Return on Investment perspective. Investments were larger than this. However, we believe these two numbers do belong in the same conversation and provide a useful perspective on the project's achievements.

In light of the above caveats (investment in all likelihood significantly greater than €4.5M), the income figure may come across as somewhat underwhelming. Additional considerations should however be factored in. In particular, outcome of the Experiments Instrument takes time to crystalize. For illustration, years later, we are still surprised to hear of new success stories from (original) ECHORD Experiments. Within Call 1 of ECHORD++, there is at the very least one Experiment highly likely to reach market in the coming years. However, being in the medical sector, navigation of the certification process is delaying materialization of the outcome (*delayed impact*). We will not speculate on what would be possible cumulated (Call 1-wide) turnovers in coming years. However, we can safely say that the 2017 figure (€1.3M) is expected to significantly grow over the years; this growth driven both by the arrival on the market of additional products finding their roots in Call 1, but also from business development of those Experiment Partners already making sales.

In complement to the above considerations, we believe it is important to recognize the fact that, while sales are a valuable performance metric (reflecting the *"to Market*" part of the project's motto), there exist other ways for ECHORD++ Experiment to become successful. In some cases, the Experiment itself was conceived in a manner that (stand-alone) sales are not actually expected. SAFERUN, in Call 2, is intended to develop new software for Automated Guided Vehicles (AGV). That software will be included

within the product of the industrial Partner, Elettric 80 SpA (E80). This SME designs and builds manufacturing plants. The improvement to AGV's performance will have a profound impact on their core business. It relaxes a number of constraints which will provide E80 engineers additional freedom in designing factory floor plans. It fundamentally changes their business for the better. Yet, it is impossible to attach a price-tag on the new software itself. It is only a small component of the overall product, and has little commercial value on its own. Its value is intangible, yet it is valuable enough that when asked by the ECHORD++ monitoring team whether E80 would be comfortable will allowing other partners in the Experiment to commercialize the software (making it available to E80's competitors), the answer was decisively and unequivocally negative. SAFERUN will never make a sale, it will never contribute to a cumulated Call 2 turnover figure, and its impact is, in that sense, *intangible*. But we still see it as a success. Technology was effectively transferred from academia to industry, and the company involved was able to benefit from European robotics and ICT expertise to improve its processes and products. There exist Experiments that lie in between the above examples. For instance, developments performed within the MARS Experiment are expected to be expanded upon internally by the industrial partner, Fendt. It could still be years before any concrete income is generated as a result (meaning it is a case of *delayed impact*). In addition, it is very possible that outcome of the work performed will only indirectly be incorporated within Fendt products, leading to a case of *intangible impact*.

Figure 3 Mars Swarm Robot on the field, right: Thiemo Buchner from AGCO Corporation, controlling the Mars Swarm

The Mars Experiment is however still widely acknowledged as a success. Merit of the technology developed is such that the industrial partner has chosen to invest a considerable amount of its own, in-house resources to carry it forward. In a similar manner, a number of other Experiments have proven successful in, on the strength of results achieved within ECHORD++, securing additional investment to either directly follow-up on developments conducted towards industrialization (a Call 1 partner has for instance secured a phase 2 SME instrument grant, with support in excess of €2M), or pursue additional developments building upon their achievements in ECHORD++ (e.g. one of our Call 2 Partner has secured over €2M in research funding).

A striking emerging trend, when looking back at the outcome of Call 1 Experiments, is the heterogeneity of situations and needs of the different partners involved. No two Experiment is truly alike, technological devices developed end-up in different places along the Technology Readiness Level scale, and the needs of partners, in particular in terms of support required to reach market, vary wildly. A recurring theme however is the trend towards narrowing down of product scope. Specifically, in a number of instances,

introduction on the market of the Experiment's target output (typically, a robotic prototype) has proven to be a challenge, due to a combination of narrow target audience, and complex system difficult to qualify and bring to market-ready maturity. Instead, Experiment Partners have in a number of instances turned to commercializing building blocks of the overall system. For illustration, ANYbotics, the start-up founded based on developments conducted in MODUL, began by commercializing the Series Elastic Actuator (SEA) they designed as a building block to the Experiment's actual output, a quadruped robot. They have since managed to sell a number of full robots; however, the target audience for quadrupeds is significantly smaller than that for actuation. The barrier of entry (cost) is also significantly higher for a quadruped (six digits versus 3). A similar development is occurring within the LINarm++ Partner carrying the technology forward. The original device, a robotic rehabilitation system, is struggling to find a market. They are now moving towards commercialization of their own SEA, developed as a building block of the rehabilitation system. Similarly, Avular (SME partner in the Call 2 Experiment SAGA), is in the process of re-inventing themselves, having struggled to make it into the drone market (quadrotor UAVs), they are now commercializing one of the system's building block: The on-board computer, packaged with a navigation module, and robustified for outdoor operation.

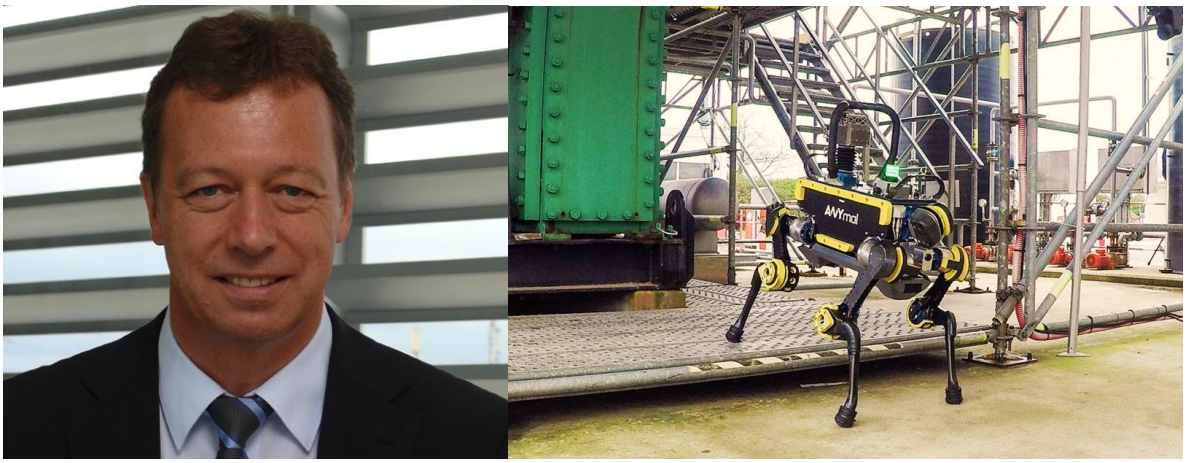


Figure 4 Dr. Hanspeter Fässler, Chairman and Co-Founder of ANYbotics (left), ANYmal quadruped robotic platform (right).

Experiment Booster Programme

As previously discussed, successfully bringing an innovative robotic product onto the market is a challenging proposition which requires talent, commitment, but also a dose of luck. To support Experiment Partners that have shown promise, but for whom there remains a number of hurdles to overcome, Core Partners are implementing a supplementary support programme: The Experiment Booster. The concrete objective of this programme consists in addressing the specific needs of Experiments selected to reach successful commercialization. Because each Experiment is different, specific support provided will differ. The type of support may include any combination of: Market analysis, business planning (for Experiments that have changed the product they intent to commercialize), support in seeking investment, technical support for industrialization (reducing manufacturing cost) and prototype qualification (bridging the gap from TRL7 to 8).

The programme was announced to Call 1 and Call 2 Experiments on 28/07/2017, Core Partners fielded inquiries from interested Experimenters through September and October. The Call for Proposals was

opened 08/11/2017 for a week. Evaluation was performed by Core partners, and results were communicated to applicants on 17/11/2017. An overview of these results can be found in *Table 3*.

Table 3 Evaluation results for all received Booster proposals; proposals were evaluated for excellence, impact, and implementation with grades out of 5, they are ordered according the average grade received. Disqualifying grades are shown in red.

Experiment	Partner	Call	Evaluation			Avg.	Location
			Excellence	Impact	Implem.		
EXOTrainer	Marsi Bionics	1	4.25	4	5	**4.4**	Munich
MODUL	ETH	1	4.25	4.25	4.5	**4.3**	Zurich
SAGA	Avular	2	4	4.25	4	**4.1**	Eindhoven
LINarm++	CNR	1	3	4	3.75	**3.6**	Munich
3DSSC	FRS	1	3.5	3	2.25	**2.9**	Heverlee
HOMEREHAB	UMH	2	3	2.75	2	**2.6**	Elche

Of the six proposal received, two fell below the qualifying threshold in the impact and implementation categories (4/5 and 3/5, respectively). The four qualified proposals were supported. Specific activities vary from partner to partner. Both Avular and the small group from CNR find themselves in the difficult process of reinventing themselves. They both encountered difficulties in bringing to market their original target product (drones for Avular, physical rehabilitation devices for the CNR team). Accordingly, the original market analysis and business plan they had developed during the run-time of the Experiment is of little relevance today. Within the Booster, they will receive support on these aspects, in Munich from UnternehmenerTUM for CNR, in Eindhoven from HighTechXL for Avular. With the support, CNR will also work on qualification of their SEA prototype, whereas Avular is receiving support in the form of personnel resources for target-customer engagement and business development. Modul will work on product qualification and industrialization (from Zurich). Finally, EXOTrainer will relocate one employee to Munich for 10 months to receive support and coaching from UnternehmerTUM on how to engage the German healthcare market, in the perspective of introducing the EXOTrainer product on the German market.

The average requested funding for each Booster Programme is of the order of €80K. Activities are funded using left-over budget from Call 1. Duration of activities are expected to be of the order of 10 months, to occur within the period going from February 1rst 2018 to January 31rst 2019. Supervision of activities and of outcome will be performed by Core Partners. Of the four funded programmes, two will be undertaken in Munich (EXOTrainer and LINarm++) on the premises of TUM, who will engage the corresponding partners on a regular basis. Regarding the Boosters in Eindhoven and Zurich, Core Partners will organize an on-site visit at the latter stages of the programme to discuss outcome with the Experimenters.

2.2.3 Work Package 4: Robotics Innovation Facilities (RIFs)

Task 4.2: Set-up Phase for the RIFs

The full list of local personnel and available resources, including hardware and software, available to RIF beneficiaries at each of the three RIFs is detailed within the RIF Handbook. Listed below are the new resources acquired during the current reporting period.

RIF@Bristol: new acquisitions

- Hand from Open Bionics,
- New Gripper and Force Sensor,
- Pickit Camera System,

- Light gates for the robot cell.

In addition, in terms of personnel,

- Eugenio Bernardi replaced Sam Forbes (Technical Service Engineer),
- Amey Prabhune employed for Limited Period (Electronics Engineer),
- Interns (continued support to RIF project work).

RIF@Paris-Saclay: new acquisitions

- 1 x Staubli TX90,
- 1 x 6 DoF HAPTION Haptic device,
- 1 KUKA IIWA,
- 1 ABB YUMII,
- 1 COBOMANIP from SARAZIN,
- 1 x 3 DoF collaborative robot arm SYBOT demonstrator PK0,
- 1 x 6 DoF collaborative robot arm SYBOT demonstrator PK2,
- Lower limb exoskeleton HVSLIM.

RIF@Peccioli: changes in personnel

- Francesca Cecchi, SSSA Project Manager (Biomedical Engineer),
- Gastone Ciuti, Delegate to Technology transfer at the BioRobotics Institute (Assistant Professor),
- Lorenzo Barsocchi, collaboration on RIF outreach activities (Managerial Engineer).

Tasks 4.3-4.4: Handling of Applications – Operation of the RIFs

Hereafter, for clarity and ease of exposition, activities of the RIFs and progress towards objectives are presented RIF-by-RIF for the two Tasks that their daily activities are largely comprised of; that is, Task 4.3: Handling of applications, selection, prioritisation, and scheduling, and Task 4.4: Operation of the RIFs with user access. Collated engagement and collaboration statistics are provided at the end of this Section. Discussions of perspectives of RIF operation beyond E++ are included.

RIF@Bristol

RIF@Bristol, as part of its continuation strategy is seeking funding from collaborative research projects that are supported by local, national or European funding sources. A number of initiative have been followed in this regards, among which are:

Funding Secured

TERRINet Project, duration 48 months; this is a joint activity with a number of European institutes and organisations including five members of the ECHORD++ consortium. BRL's budget is circa EUR 384,859. The role of RIF@Bristol shall be the organisation and scheduling of training and summer school sessions for training of personnel across from Europe.

Awaiting Funder's decision

1) An application for funding via HEFCE of a project in collaboration with University College London and Loughborough University to develop the provision for training of engineers. The aims of this project are

somewhat similar to RIF in that it is an enabling initiative. A key objective is to develop an interface between universities and industry to transfer of knowledge between the two. The BRL's share of this project is circa £1m and duration will be of the order of three years.

2) An application for funding for circa £4m over three years has been sent to ERDF to develop a programme to assist around fifteen organisations in Bristol area. The assistance will take the form of a three months collaborative project in providing robotics and automation solutions to the SMEs in this area.

The decision for all the above projects will be announced in the first quarter of 2018.

The diagram below shows the current and future prospects of funding for RIF@Bristol for the near term.

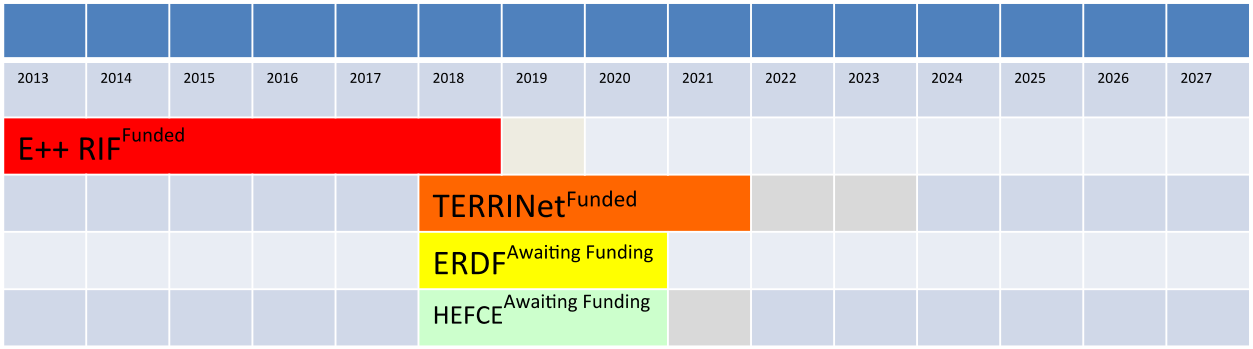


Figure 5 Support for the RIF@Bristol activity over time.

Other recent events
BRL RIF has been registered as a Digital Innovation Hub.

A System Integrator has been introduced to a robotic project with a multi-national. RIF@BRISTOL was the key player in developing the relationship.

Further, another SI has started a dialogue with RIF@BRISTOL and will be engaged in delivering end-effectors when the requirement arises.

An opportunity to collaborate with a Norwegian SI and robotic supplier has arisen from a joint PhD program being carried out at RIF@BRISTOL. It is envisaged that a project on polishing for a large aerospace firm may result from this collaboration.

The collaboration with Natwest bank has now matured and a number of their clients have engaged RIF@BRISTOL for preliminary investigations. These are on-going activities with potential to develop into funded consultancy and assisted projects.

An Innovate UK funded project that resulted in the installation of an automated assembly system at a vacuum cleaner manufacturer has been awarded a rating of 'Excellent' by the funder. This project has been an early beneficiary of RIF Instrument.

PhD projects
Currently three PhD programs are underway in RIF@Bristol:

- Brian Wang PhD project on polishing,
- Enrico Sita, PhD project on Remote Presence in collaboration with PPM, Norway,

- Hatem Qussay Kareem Fakhruldeen PhD project on Automated Assembly.

Perspectives beyond E++ for the RIF@Bristol

RIF@Bristol has developed a business plan for operation beyond the funded period. The aim is to generate income via training provisions, consultancy and seeking funded projects. As stated above a number of applications have been made for funded work. It is proposed that in early 2018 a number of training modules will be developed for delivery in the latter part of 2018. A number of consultancy projects are currently being pursued, but as yet no contract has been secured. The business plan was presented to the University Directorate and it has been approved. A sample section is shown below.

BTS-RIF Income Post Funded Period Business Plan Predicted Income

		Year 1	Year 2	Year 3	Year 4	Year 5
Income	Skills Training	33600	47700	80400	177300	238700
	Consultancy	60000	100000	100000	100000	100000
	Managemen	12600	12600	18900	18900	18900
	Other BRL So	25000	25000	25000	25000	25000
	Incubation*	18000	27000	31200	31200	31200
	Total	149200	212300	255500	352400	413800
	*******	*******	*******	*******	*******	*******
		******	*******	*******	*******	*******
Net Surplus/(investment)		-18645.38	-10230.76	2819.24	9819.24	14379.24
Existing grant contribution		20000	10000			
Incubation related grants		20000	30000	30000	30000	30000
Net Surplus/(investment)		21354.62	29769.24	32819.24	39819.24	44379.24
Cumulative		21354.62	51123.86	83943.1	123762.34	168141.58

Figure 6 Perspectives of incomes and expenses for the RIF@Bristol.

RIF@Peccioli

Key achievements

- 7 new collaboration with companies since March 2017,
- 10 companies engaged (pipeline) ,
- 37 new contacts with local companies,
- Strong involvement in the “Festival Internazionale della Robotica” on September 2017 in Pisa,
- New corporate image and information material,
- Joining the “Tuscany Regional Platform Industry 4.0”: technical-operational interface between regional, economical and technological initiatives and the National Plan Industry 4.0.

Networking and dissemination

The International Robotics Festival aimed to develop the knowledge of this field in all areas and applications. Robots were the main protagonists of the Festival, showing how they could be used in the fields of

surgery, rehabilitation, care for the elderly and disabled, bionic prostheses, physical and emotional interaction with people, education, collaborative industrial robotics, precision agriculture, marine robotics, drones, circular economy, roboethics and art. The BioRobotic Institute was one of the main organisers of this event and the Robotics Festival has been a perfect stage to present the ECHORD++ project to companies, entrepreneurs and System Integrators.

Figure 7 Impressions of the "Festival Internazionale della Robotica"

Interaction with System Integrators

RIF@Peccioli delivered a dedicated workshop for System Integrators in the "International Robotics Festival", held in Pisa on September 2017. The Festival gave the possibility to SIs to present their works, to connect each other and to get information about existing projects and programmes.

Thanks to this event, RIF@Peccioli was able to map the presence of System Integrators in Italy and collect information about them. New engagements derived from these contacts will be achieved in the next reporting period.

RIF@Peccioli collaboration and engagements

During this third period of the ECHORD++ project, RIF@Peccioli collaborated mostly with local SMEs on consultancy activities: most of these companies are based in Tuscany and are not working in the robotic field, therefore they requested consultancy services.

Many companies in fact requested RIF services for exploring possible robotic applications in their field and searching partners who could help them to understand how to manage the product development.

For this reason, in this period RIF@Peccioli provided services such as market analysis, feasibility studies, project planning and assistance to submit proposals for national or regional funding calls about robotics and technological applications.

A recent Success Story

On August 2017, RIF@Peccioli started a collaboration with Giannoni&Santoni (http://www.giannoni-santoni.com/), a local company operating on the art and architecture field. The core business of this company is the realization of internal and external decoration for museums, art installations and private houses.

Their request was the development of a robotic painter: a robotic arm capable to print fine art pictures directly on different surfaces. The robot has to be able to print on very large and curved surfaces and to recognise obstacles (such as edges, gaps, discontinuities, frames …) and print on them.

Giannoni&Santoni contacted the BioRobotics Institute to explore the possibility to develop this kind of robot: thanks to the ECHORD++ project we were able to provide them a complete market analysis, patent analysis, feasibility study and assistance in submitting a joint proposal to a regional funding call (results expected on Spring 2018).

Towards RIF@Peccioli's Sustainability

RIF@Peccioli impact analysis: The RIF@Peccioli has the capacity to bridge the industrial and academic worlds, acting as a mediator. Peccioli RIF in the last year offers its services to companies not working in the robotic field: since the RIF mainly works in the areas of Peccioli and Pontedera, we extend our services to manufacturing sector that is the local key market. Small companies are very interested in the possibilities given by the RIF, and they are looking for us to take the chance.

RIF@Peccioli concept follow-up: During this period the RIF@Peccioli involved new members in its staff to better conduct the final stages of the project. The main efforts were on the definition of the future RIF strategy, learning to recognize the local dimension and characteristics of our market, watching carefully the needs of the companies in our territory and refining RIF service portfolio.

RIF has proved to be the right instrument to promote Technology Transfer activities in order to create a solid and well-structured communication channel between industrial and academic world. RIF has the right approach: it is able to listen to the companies' needs and propose an appropriate solution given by academia.

Thanks to that, RIF@Peccioli is now working on a new strategy for the post-E++ RIF sustainability.

RIF@Peccioli business strategy: The RIF@Peccioli is working on a business strategy based on a model where the RIF is an internal player: it will represent the direct link between companies and the SSSA BioRobotics Institute and/or other spin-off companies of our network.

This sustainability project (please see the Business Plan chart below) will consider five years after the E++ project: RIF will gain incomes from training and, mostly, from consultancy; it will have personnel, consultancy, office and material costs.

Skills training is assumed as a low-income asset due to the low interested in this activity currently measured. These training sessions will be focused on the Industry 4.0 plan, robotics technical skills and grant proposals technical aspects.

Consultancy instead will be the main asset of Peccioli RIF: current analysis of RIF activity revealed that this is the most required service, so we plan to have collaborations about consultancy service with at least 10 companies in the first year after E++ project.

Regarding outcomes, on year 1, we assume two people working at the RIF as commercial office and other people from SSSA hired time by time as consultants (increasing in the following years); external consultancy will be needed for the very specific and technical services RIF cannot provide autonomously. We are planning to apply to regional or national calls to get funds to let the RIF be autonomous since year 1. The diagram below shows the current and future prospects of funding for RIF@Peccioli for the near term.

Figure 8 Current and future prospects of funding for RIF@Peccioli

This is a very early-stage Business Plan: we are working on a detailed version in the next months.

Table 4 Perspectives of incomes and expenses for the RIF@Peccioli

Peccioli RIF - Post-E++ Business Plan

		2019 Year 1	2020 Year 2	2021 Year 3	2022 Year 4	2023 Year 5
Incomes	Skills Training	5.000,00	6.000,00	7.200,00	8.640,00	10.368,00
	Consultancy	100.000,00	130.000,00	200.000,00	250.000,00	300.000,00
	Total income	**105.000,00**	**136.000,00**	**207.200,00**	**258.640,00**	**310.368,00**
Outcomes	Personnel	90.000,00	100.000,00	130.000,00	150.000,00	150.000,00
	External consultancy	10.000,00	20.000,00	30.000,00	70.000,00	100.000,00
	Other costs	10.000,00	12.000,00	14.400,00	17.280,00	20.736,00
	Total outcome	**110.000,00**	**132.000,00**	**174.400,00**	**237.280,00**	**270.736,00**
	Net Surplus	-5.000,00	4.000,00	32.800,00	21.360,00	39.632,00
	Regional or national Grant	20.000,00	10.000,00			
	Net surplus	**15.000,00**	**14.000,00**	**32.800,00**	**21.360,00**	**39.632,00**
	Cumulative	**15.000,00**	**29.000,00**	**61.800,00**	**83.160,00**	**122.792,00**

RIF@Peccioli possible opportunities

The BioRobotics Institute is collaborating with the Tuscany Digital Innovation Hub. SSSA is waiting for the national call for the establishment of the Competence Centre foreseen in the National Plan Industry 4.0.

RIF@Paris-Saclay

Hereafter are discussed activities over the Reporting Period for the RIF@Paris-Saclay.

Key achievements

- Four new collaborations with industries demonstrating the interest of collaborative robotics in period. 7 collaborations to come for the end of 2017 and 2018,
- Creation of the Digihall Digital Innovation Hub materializing the embedment of the RIF@Paris-Saclay in the Ile de France Digitizing strategy of the Ile-de-France region,
- Creation of iSYBOT company, incarnating the support from E++ in the conception of a new type of collaborative robot,
- The RIF@Paris-Saclay becomes the Competence Centre for robotics in Paris region,
- CEA obtained the support of the Ile-de France region to create the DIGIHALL Digital Innovation Hub1 Founding members of DIGIHALL are (CEA, IRT SystemX, Systematic cluster, Inria, Télécom ParisTech and Télécom SudParis). DIGIHALL covers four development axis: Artifical Intelligence, Factory of the Future, Cyber Physical System and Digital trust. DIGIHALL takes large advantages of the experience gained at the RIF Paris-Saclay.

Figure 9 Location of the CEA Digital Innovation Hub Digihall

Interaction with System Integrators

CEA is engaging regularly now with integrators. The goal is to cover the value chain and facilitate technology transfer. Integrators are engaged during the information days and in collaborations. In collaborations, an ideal case is when integrators are involved from the beginning of the collaborations. Some example of organizations contacted,

- **GEBE2**: integrator in the domain of aeronautics involved in a collaboration on polishing of surfaces with the PK0 (Sybot) collaborative robot,
- **Actemium**: integrator in the domain of automotive industry involved in a collaboration on benchmark of collaborative robot,
- **Opteamum**: Integrator in the domain of industry involved in a collaboration on assembly of furniture packings,
- **Fives**: integrator in the domain of automotive industry involved in a collaboration on engine small part assembly,
- **HMI**: Integrator in the domain of industry involved in an exploration of a new domain, agriculture.

Engagements and collaboration

During this third period of the project Echord++, CEA kept on its effort to engage with industries and conduct collaborations to promote usage of robotics. The RIF@Paris-Saclay activities are focused essentially on industrial applications like automotive and aeronautics. An attention is maintained to stimulate collaborations in the domains of agriculture and agro food as well as healthcare and inspection and maintenance for hazardous environments.

The RIF@Paris-Saclay main offer is on technologies enabling human robot collaboration with no fences in mobile manipulation applications. The Paris-Saclay RIF supports different technologies enabling this human robot collaboration. Technologies include different involvement of the user in the tasks and include teleoperation, master slave control, cobotics, coworking as referenced in the literature and autonomous robotics.

Robots used available for the collaboration include commercial robots from RB3D (A615), SARAZIN Technologies (Cobomanip), KUKA (IIWA), ABB (YUMI), Staubli (TX90). CEA RIF promoted also a new forms of robot for human robot collaboration. The objective is to provide robotics solutions based on innovative actuators intrinsically safe by electromechanical conception.

- 3 axis and 6 axis robot arms (PK0 and PK2 also called SYBOT) providing force feedback with no force sensors
- Lower limb exoskeleton HV-SLIM

Most of the engagements and collaborations conducted in this period are located in France. A large part of the effort conducted targeted SMEs, however the RIF@Paris-Saclay maintains also many contacts with large groups asking for special solutions which they cannot find on the shelf in the market. The experimentations conducted are most of the time targeting feasibility tries or demonstration (TRL6 to TRL7).

Success story
Collaborations conducted with the support of Echord++ contributed to the creation of the iSYBOT Company in October 2016. The SYBOT arms PK0 (3 axis) and PK2 (6 axis) used in several experimentations are the roots to the product to be commercialized by iSYBOT. iSYBOT has now 6 employees and is developing its own commercial activity.

Two collaborations conducted to the elaboration of a new robot Cobomanip for the SARAZIN SME. One of this collaboration dedicated to demonstrate the interest of a new actuator to enhance the performances of a robot for co manipulation. A second collaboration demonstrated this interest of the former version of the Cobomanip robot for an industrial application in aeronautics.

RIF concept follow up
CEA spent some effort in this period in preparing a follow up to the RIF activities. Several tracks were and are still investigated.

One first track is the convergence between the concept of RIF and the principle of Competence Centre defined in the I4MS8 program. CEA became one of the robotics Competence Centre for manufacturing in 2016 http://i4ms.eu/regional_hubs/map.php. Within the HORSE project, CEA is the main driver of the concept of robotics Competence Centre.

A further track investigated this year at CEA is to extend the RIF into a larger concept of Digital Innovation Hub (DIH) promoted by the EC within the Digitizing European Industry. CEA participated to workshops organized by the EC dedicated to these notions of DIH. The expertise of the RIF@Paris-Saclay was used to write a position paper on DIH distributed to the ministries of Research and Ministry of Industry in France and to the EC. The concept of DIH is implemented at the level of the institute CEA LIST. It is called DIGIHALL. It is supported by the Ile-de-France region9. DIGIHALL has a broader scope than robotics technologies and covers all application domains. Some of the DIGITHALL concepts are however based on the early ideas of the RIF. For instance one of the objectives of DIGIHALL is to stimulate usage of technologies and facilitate cross fertilization between research and industry. Hence the RIF@Paris-Saclay will keep on existing beyond Echord++ term.

Financial Sustainability
In order to reach financial sustainability CEA investigates business models relying on different sources of funding. The model investigated now covers three sources of funding

- **Public funding**: This covers funding coming from EC Frame Programmes like H2020,
- **Investment funds**: this includes usage of structural funds (ESIF) and exploitation of the Junker plan (EFSI),

[8] ICT Innovation for Manufacturing SMEs
[9] http://www.cea.fr/presse/pages/actualites-communiques/institutionnel/concours-architecture-digihall-finalistes.aspx

- **Private funding**: which gathers direct funding from bilateral contracts with industries and fees to access specific IPR or knowledge held by the RIF in robotics.

The business plan foreseen to reach this sustainability relies on CEA experience. The objective is to reach an income of 1.2M€ each year. This represents about 1/3 of robotics lab budget. We target a median income of 100k€ per experiment with SMEs and industries to cover cost for resources, effort, equipment, consumable and travel.

To reach this sustainability, the phasing would be the following:

- **Y1**: 3 experiments per year,
- **Y1+2**: 6 experiments per year,
- **Y1+3**: 12 experiments per year.

Networking and dissemination

Beyond its regional activities in Ile-de-France region, RIF@Paris-Saclay maintains regular connections with other regions in France. The RIF model is indeed interesting for other organizations CEA is in contact with in Metz, Nantes, Bordeaux, Lille and Toulouse regions for instance. RIF@Paris-Saclay maintains also close connections with the technological platforms FFLOR and Factory Lab mentioned in the report for the previous period. These platforms dedicated to manufacturing: Factory-Lab in Ile-de-France region (inaugurated in October 2016) and FFLOR in the east of France (inaugurated on the 31st of January 2017) are meant to facilitate take up of ICT (including robotics) on the production lines. These platforms were co-founded and involve both large groups and key players of the Industrie du Futur in France (ACTEMIUM, PSA, DCNS, SAFRAN, Dassault, CETIM, Arts&Métier) for Factory Lab.

CEA LIST participated to different event to attract SMEs and communicate about the RIF offer:

- In April 2017 at the Hannover fair to communicate about the RIF@ParisSaclay with SMEs and interaction with robotics industries to improve the relay between research and industry,
- In Florence in June 2017 (Italy) to communicate about the RIF actitivies during the participation about the TANGO SCADA tool,
- In Grenoble November 2017, to stimulate SMEs in the region to use the RIF,
- In December 2017 in Bordeaux to communicate about the opportunities at the RIF@Paris-Saclay.

Collaborations of the RIF@Paris-Saclay actions in 2017

- **LAMAP (La Main à la pâte)**: located in Blois, this collaboration / workshop was meant to train, coach teacher's pedagogues on robotics
- **MBDA**: this collaboration carried on manipulation of parts for the aeronautics industry. The experiment was conducted with the COBOMANIP from SARAZIN
- **SNCF**: the collaboration demonstrated the possibilities to use a collaborative robot to execute sanding of trains to remove paint using the PK0 demonstrator (3 axis Sybot)
- **SARAZIN**: the result of this collaboration is the assistance to the development of a force driven actuator on a collaborative robot COBOMANIP.
- **COLAS**: this collaboration demonstrated the use of the lower limb exoskeleton. The goal is to realize an machine able to carry tools to assist for demolition tasks with the HV-SLIM lower limb exoskeleton

- **FIAT PowerTrain**: this collaboration carried on motor assembly and especially insertion of jackets in cylinders using the PK0 demonstrator (3 axis Sybot)
- **Dassault aviation**: the collaboration demonstrated the possibilities to execute screwing in an aeronautics application using the PK2 demonstrator (6 axis Sybot)

Preparation of 2018 collaborations

Some engagement taken with industry until 2017 will result in collaborations in 2018. An action plan for RIF@Paris-Saclay activities is under elaboration. The collaborations foreseen at the time of the editing of this periodic report are the following

- DIACE is an SME interested in using cobotics for manipulation of castings, using SYBOT,
- SOLISTICS is an SME asking for demonstration in cobotics for manipulation,
- STAUB is a an SME interested in using cobotics or manipulation of casserole dish,
- TOYOTA and PSA are asking (separately) for a demonstration of exoskeleton for assistance on production line. We will make use of the HV-Slim.

Some other possible collaborations for 2018 and beyond,

- An actor of the electrical cabinets and inverter (SME): asking for industrial support,
- An SME in agro food interested for industrial support and RIF@Paris-Saclay expertise on interactions between TANGO (SCADA) and collaborative robotics,
- A French start up (JYSE) in configurable dashboards for the industry. Undergoing a background survey.
- An SME in Grenoble, a subsidiary of a French group: assistance and audit on the implementation of an intelligent cell for bio-medical applications ,
- Postal sorter, subsidiary of a US group: proposal for handling stack of mail. Asking industrial support from the RIF ,
- Ez-Wheel, French smart wheel startup (PRTT ACQU). Asking to use of the RIF to take over part of the work and industrial support.

Global RIF User Interactions

The three RIFs have commenced collating and sharing local operatonal data to reflect the type of user to the RIFs. The following table and accompanying charts represent the collated information providing a breakdown of the RIF client by type against activity:

RIF User Type: Breakdown by Activity (Oct 2013 to 30 Nov 2017)

Table 5 The information above represents the collated data from all three RIFs since launch

Global RIF Group

RIF User Type: Breakdown by Activity (RUNNING TOTAL)

Unique clients: **1113**

Digital Media	Twitter Followers	LinkedIn Contacts	Facebook Fans	YouTube Views	Email - Organisations	Email - Individuals	TOTAL
Connections	2029	0	0	7658	1957	4058	15702

Interactions	Researcher	Entrepeneur (Unregisterd)	Start-Up	SME	Large Business	Public Body	Research Centre	HEI	Network	TOTAL	% of Interactions
InfoDays	47	0	0	33	1	3	0	9	0	93	7%
RIFLaunches	51	0	6	101	20	8	5	5	6	202	16%
External Events	0	0	10	217	43	12	23	13	73	391	32%
Collaborations	7	0	17	56	26	0	1	1	0	108	9%
Workshops	42	0	8	208	39	9	4	30	11	351	28%
Market Assessment	0	0	6	2	0	0	0	0	0	8	1%
Internships	33	-	-	-	-	-	-	-	-	33	3%
E++ Experimenters	0	0	0	5	2	0	3	0	0	10	1%
Pipeline	0	0	1	34	9	0	0	1	0	45	4%
	180	0	48	656	140	32	36	59	90	1241	

	Researcher	Entrepeneur (Unregisterd)	Start-Up	SME	Large Business	Public Body	Research Centre	HEI	Network	TOTAL
Unique Clients	150	4	42	600	133	26	37	49	72	1113
% of Total Clients	13%	0%	4%	54%	12%	2%	3%	4%	6%	

Task 4.5: RIF process adjustment

As mentioned above a potential a collaborative project on polishing may emerge. It is likely that at least Bristol and Paris will collaborate on this work (every endeavour will be made to include Peccioli in this project if appropriate). The scheduling of tasks and use of resources both equipment and personnel will be determined at an appropriate stage.

RIF@Paris-Saclay changed the tool it was using this year to harmonize management of quality management at CEA. The tool enables to record contracts, and interactions with collaborators. Some improvements are under study to facilitate statistical analysis and especially to record more accurately the effort spent.

2.2.4 Work Package 5: Public end-user Driven Technological Innovation (PDTI)

By involving all relevant stakeholder groups – the public bodies (challenge providers) with their corresponding testing environments, academia and industry (as RTD consortia) combined with additional expertise (depending on the challenge), as well as members of the E++ core consortium (as facilitators of the process), PDTI can be taken as a prototypical example of user-centered design and technology development. In the case of the CLARK RTD consortium, PDTI has demonstrated that the close interaction between end-users and technology development teams (with moderators acting as transmission belts in-between) can initiate a mind-shift in the design approach and enable technology transfer that may not have happened otherwise. In both Challenges – Healthcare and Urban – the access to test environments has proven a crucial success factor. In addition to this, PDTI has shown to provide the necessary flexibility to adjust to different objectives (here: urban and healthcare) while keeping the main principle – the involvement of all stakeholder groups in the entire technology development process – intact. The activities

during the reporting period have again demonstrated that inspiring the user-centered approach in development teams is a tremendous effort, particularly if the teams have not been exposed to such an approach before. But it is crucial to prevent the development of research-driven technology which fails to meet market needs.

The below table compares the two areas in terms of timeline, definition of KPIs, involvement of stakeholders during the monitoring, the major challenges and the expected technology readiness at the end of Phase III.

Table 6 Comparison Healthcare and Urban Challenge at the end of Phase III

	Healthcare	**Urban**
Timeline	End Phase I: 09/2016 Start Phase II: 06/2017 Reason: Redress by ARNICA On-site review: 28.02.2018 Start Phase III: 04/2018 Remaining runtime:20 months Phase II: 10 months (06/17-03/18) Phase III: 10 months (04/18-01/19)	End Phase I: 06 / 2016 Start Phase II: 09/2016 (decoupled from healthcare) End Phase II: 09/2017 One-site review: 16.-17.10.2017 Start Phase III: 11/2017 Runtime: 24 months Phase II: 09/2015 – 09/2016 Phase III: 12/2017 – 12/2018
Monitoring	Combination of remote monitoring based on KPIs and on-site review at the end of Phase II; in-between physical testing in hospitals to involve end-users. KPIs discussed 06/2017 early 09/2017 between E++ core and both RTD teams, then active monitoring implemented since early September with monthly calls.	4 monitoring periods with documentation and tests required from both consortia to describe and illustrate the progress: kick-off – monitoring telco after 1rst monitoring period with deliverables - physical demonstration – remote monitoring with submission of deliverables - on-site review at the end of Phase IV. Evaluation criteria for Phase II discussed between public body and E++ core; presented to the two RTD teams in a kick-off meeting and summarized in a dedicated document; recommendation after Phase I: improve the prototype and the technological solutions.
Benefits	Allowed for an open dialogue with all stakeholders (RTD teams, public body, E++ core consortium, and the independent experts) to assess the performance in the on-site review after Phase II. Democratic approach on negotiating KPIs with all stakeholders (based on	The more top-down approach on the definition of the evaluation criteria allows for a swift process as less interrogation loops are necessary. Sewer started with full-fledged set of evaluation criteria from the beginning. Thus the targets were very transparent for both teams from the very beginning of Phase II.

	a suggestion by TUM / BOR) led to identification of "bottlenecks" which might have caused otherwise problems later on (i.e. voice recognition). Stakeholder engagement led to inclusion of test and metrics which facilitated a shift from qualitative towards quantitative (more objective) KPIs for performance assessment and comparability between the teams.	Physical demonstrations are essential to assess performance if the refinement of prototypes is key. The constant access to the physical testing environment strengthened the links between the end-user and the RTD teams. The end-user – unexposed to robotics at the beginning, now clearly sees the benefits.
Budget	Equally divided between Phase II and Phase III (230.000 €)	2/3 for Phase II and 1/3 for Phase III
Number of prototypes expected:	After Phase II: One per team After Phase III: 3 per team	After Phase II: One improved prototype for each team After Phase III: Two prototypes per team
TRL Levels	After Phase II: 6 After Phase III: 7-8	After Phase II: 6 After Phase III: 7-8
Special features:	Delay by redress ARNICA; No time for exploitation after Phase III; High comparability between the teams due to identical set of KPIs despite differences in approach of the two teams; Business training (proof of approach for DIHs); Independent experts to assess performance in on-site review are part of the monitoring and give guidance to the two teams.	More a top-down approach at definition of evaluation criteria and procedures (defined between E++ core and public body); Physical demonstrations in combination with permanent access to testing in the sewer properly reflects the requirement to improve the prototype; Both consortia were asked to submit business plans. Both solutions are economically viable. The challenge for both RTD teams lies in overcoming the constraints of their technologies.

Task 5.8: Development of prototypes, scientific monitoring, feasibility studies

Healthcare Challenge: Context and timing of activities during the Reporting Period

As discussed in PR3, the redress submitted by the ARNICA consortium, following the conclusion of Phase I and corresponding selection process, has had a significant impact on the schedule of the Health-Care Challenge. While Phase I was concluded in a previous reporting period, Phase II was only able to begin by June 2017 (see discussion in Work Package 1 for further details on timing). This start-date leaving 20 months till project's end (January 2019) for both Phase II and Phase III, the decision was made to divide the remaining time evenly between Phases II and III. Accordingly, Phase II will span the 10 months from June 2017 to March 2018, while Phase III will start in April 2018 and end in January 2019. Final evaluation of Phase II is scheduled to occur on February 28th 2018; that is, about a month prior to the end of the phase. The decision for an anticipated evaluation was motivated by the necessity for a timely start of Phase III, and in particular to leave sufficient time to process the Amendment required to include Phase

III within the project, in the eventuality of a positive Phase II evaluation. Throughout the decision process that has led to the above schedule, Core Partners have pro-actively engaged dialogue with RTD consortia, and a consensus agreeable to by all parties was reached in terms of phases' duration, start dates, and Phase II evaluation date.

Healthcare Challenge: Definition of monitoring and evaluation process for Phase II

Assessment of consortia's progress and achievements is performed through two complementary modality; continuous remote monitoring throughout the Phase, and a final, on-site evaluation at the end of the Phase. The intent behind the monitoring procedures enacted (built upon the foundations laid in ECHORD and in the ECHORD++ Experiments' Instrument) consists in promoting an open dialogue between monitoring team, RTD consortia, external experts, and stakeholders. The approach provides transparency in terms of the consortia's progress towards objectives well ahead of the final evaluation. This facilitates work of evaluators, who are kept appraised of achievements at regular intervals. It is also to the benefit of the RTD consortia, as they are able to clearly appreciate to what extent they are meeting expectations.

Supporting this monitoring process, providing a clear roadmap for the consortia to follow and goalposts to strive for, is a set of Key Performance Indicators (KPIs). The definition process of this set of KPIs was collegial, initially proposed by the monitoring team, then refined through discussion with the consortia, the evaluators, and mainly with the stakeholder. Feedback from all parties was consolidated into the final version of the KPIs. Direct inclusion of the consortia within this definition process was intended to further promote transparency and underline inclusiveness and consideration for their input. On a practical note, it has allowed to detect and adjust as appropriate (following verification with experts and stakeholder) KPIs that could have proven problematic (e.g. voice recognition of geriatric patient, which lacks the robustness to prove reliably useful, as later verified with the stakeholder). This definition process and corresponding discussions and negotiations occurred over the summer of 2017, with conversations on- and off-line (Skype and emails) with consortia from June to early September, in some instances with both consortia in the call, in other cases with each consortium separately. Concertation with the end-user proved particularly beneficial as, beyond ensuring selected KPIs provided a fair reflection of the user's need, a number of tests and metrics were included and allowed to make KPIs more quantitative (and thereby more objective) in places where they could have been exceedingly qualitative and subjective. In particular on aspects related to assessing quality of data gathered by the testing procedure (fundamental to the ability of the system to be of use to the end-user).

Monitoring procedures include Skype discussion between the monitoring team, the RTD consortia, external evaluators, and stakeholder. Active technical monitoring began in September, following definition of the aforementioned set of KPIs (shown in *Table 7*), and was pursued up to time of writing of this document, with a monthly frequency to official monitoring calls, complemented by additional calls with a subset of the above groups (e.g. RTD consortia with stakeholder only).

Table 7 Set of KPIs defined to support monitoring of Phase II for the PDTI Healthcare Challenge, defined in concertation with the RTD consortia, external evaluators, and the end-user.

tKPI	Explanation	Measurement
1. Reliability of machine-to-patient communication:	Patients able to understand statements formulated by the robot through whichever modality is used, written text, visual diagrams, synthesized speech, or any relevant combination thereof.	# of times a message/statement/query from the robot to a patient needs to be clarified by the HP, over all relevant tests performed
2. Reliability of patient-to-machine communication:	Robot's ability to capture, understand or interpret test-relevant communication from patients.	# of times patient test-responses captured by the system do not reflect what was expressed by the patient
3. Data management:	Ability of the system to make data collected during tests available to the health-care professional in a convenient manner, including file format, remote network access, relevant viewers, and relevant data sovereignty aspects.	Ease of viewing test data collected, locally on the system, and remotely
		Ease of importing test data collected
		Capacities for processing collected data
4. Power autonomy, system mobility:	Length of time the system is able to operate (in nominal, test delivery conditions), and ability to move	Time measured during typical test support operation
		Safe movement speed (m/s), turning radius (m)
5. Technology Readiness Level (TRL):	Using EC scale, expected TRL by the end of pII is 6.	Initial estimation performed by e++ monitoring team, on the faith of monitoring information. Final evaluation performed by external experts on the occasion of the end-of-phase II on-site review and corresponding demonstrations

iKPI	Explanation	Measurement
1. Reliable test-delivery speed:	Speed at which the system is able to reliably perform CGA tests.	Duration of each test
		Duration of a complete sequence* of tests
		# of tests/hour (each one test to be applied to different people)
		# of complete sequences of tests/2 hours including preparation time between patients
		# of patients who may be evaluated in a regular day (4h)
2. Test-support efficacy:	System efficacy in reliably performing automatable aspects of the test, in support of the health-care professional, allowing her/him to focus her/his attention on the patient.	% of test aplication's time the HP has to be present with robot and/or patient per test
		# of times HP has to intervene during test's application
		% of test aplication's time the HP has to be present with robot and/or patient for whole sequence
		# of times HP has to intervene during a complete sequence of test
		Time saved for the HP, allowing her/him to focus on patients' care plans (3rd phase of CGA process)**
3. Quality of clinical information:	For relevant tests, ability of system to perform tests resulting in correct clinical information.	Validity evaluation of test score results in comparison to a "gold standard" method***
		Reliability evaluation (test/retest) of test through standardized method like kappa coefficient or equivalent
		Specific for motion analysis: # of clinical parameters which may be reliably evaluated by the device (gait speed, length of step, balance evaluation, etc).
		Specific for motion analysis, for quantitative items: precision of data collected or estimated (confidence intervals 95%, standard deviation)
4. Data presentation:	Efficacy of the system in presenting the data gathered in the test(s) in a manner that facilitates the assessment work to be performed by the health-care professional. To be evaluated by health-care professional.	# of different test evaluations applied during session on same screen
		# of episodes of each test on same screen in order to see evolution during certain timeframe
		# of different tests with score evolution on same screen
5. Patient acceptability:	Willingness of CGA patients to interact with the system for the purpose of the tests.	Score of usability standardized test for each test and for global system (based on significant sample)
6. Ease of operation and flexibility:	Ease of operation of the system, ease of addition of new CGA tests, ease of addition of languages. To be evaluated by health-care professional (for ease of operation), and stakeholder's IT personnel (for addition of tests and languages).	Duration of time configuration to schedule plan for tests
		Time interval between test finalisation and result output on screen
		Duration per test for HP to setup new test
		# of new item/measurements which can be added for new tests, # of type of items which may be considered for new tests: likert, quantitative items, text
		Applied to HPs: score of usability standardized test for global system
7. Quality of business plan:	Including considerations of cost, possible evidence of industrial interest, IP aspects, and argumentation of system relevance to address additional technological needs beyond the presently considered CGA challenge; to be supported by a detailed analysis.	Evaluated by E++ monitoring team in light of the opinion of, and in concertation with, potential interested customers.

HP: Healthcare Professional, **Importance** from 4: Crucial, to 1: Interesting.

* Complete sequence: Barthel, MMSE and Get up and Go test (GuG) applied to a patient, in that order

** You can consider 60 min as current usual time for a whole CGA process for one patient

*** Gold standard for Barthel, MMSE, and GuG tests are the test's scores completely gathered by a qualified HP

Healthcare Challenge: Progress of RTD Consortium CLARK in the Reporting Period

CLARK proved to be very active early on before the official start date of Phase II, following up and addressing feedback received from Phase I evaluation's review report. Phase II officially started June 1st 2017, CLARK organized a kick-off meeting in January 2017, prepared an initial set of KPIs and a PR plan in February 2017, and continued with their first user tests in March 2017. Throughout Phase II, CLARK has been proactively trying to address shortcomings highlighted in the Phase I evaluation (inadequate Human-Machine-Interface) by involving the end-user through Troyes University of Technology (UTT). As a result, the interface has made tremendous strides. This outcome illustrates the merit of the approach to PCP enacted in ECHORD++ and underlines the quality of actionable feedback provided by the evaluation process. Involvement of reviewers with different, complementary expertise has led to a holistic product development perspective, effectively supporting and guiding the RTD team in areas where they may not have had the expertise. The final evaluation highlighted clear obstacles to success for CLARK. The proposed PDTI process, in particular the multi-phase competition and selection, strongly incentivized resolution of the. In Phase II, before even the official start, the monitoring team offered support in terms of expanding on insights provided by the evaluation report, and offered connections to the right partners to decisively address the identified shortcoming.

Concretely, CLARK took the initiative in late 2016 to invite an additional partner to their consortium with expertise in translating user needs and user studies with the prototypes. To that end, CLARK created an overview of potential partners based on desktop research and suggestions from reviewers, TUM, and BOR. Evaluation criteria were discussed in a telco with TUM and BOR, in which three final potential partners were identified. Among these, CLARK selected their final partner on their own, the ActivAging Living Lab, from UTT. Based on first recommendations from UTT, CLARK redesigned the interface mock-up, which was then used in the first user studies and focus groups. These were conducted to investigate preliminary usability and acceptance feedback from geriatric patients and took place from March 28th-30th 2017 at a retirement home in Seville. On the first day, the clinicians received a demonstration of the robot. The actual tests (Get up and go and Barthel tests) were conducted on the second day with elderly patients at the retirement home. For this first testing trial, test subjects were not geriatric patients, but instead well-functioning subjects. On the last day, CLARK organized a focus group to discuss the design of the robot with engineers, a physiotherapist, geriatricians, a nurse, a psychologist, an elderly patient accompanied with caretaker, and a retiree.

Information gathered was exploited to re-design the interface (see *Figure 11*) and design a new chassis for the robot (*Figure 10*). The interface has been re-designed to fit the specific needs of elderly people, e.g. integrating large and specialized buttons. The chassis was developed based on focus-group feedback and three co-design sessions led by MetraLabs and UTT. Development decisions including form, colour, and shape were discussed in light of the testing/focus group results (*Figure 12*).

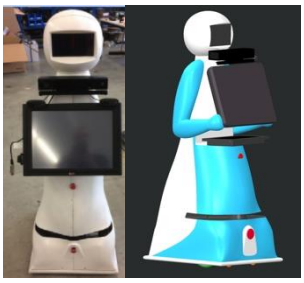


Figure 10 Robot chassis

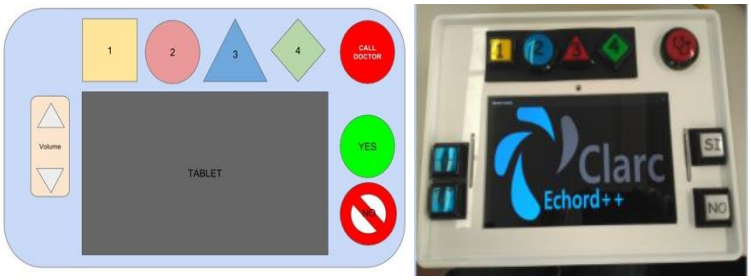


Figure 11 Robot interface design for the CLARK consortium.

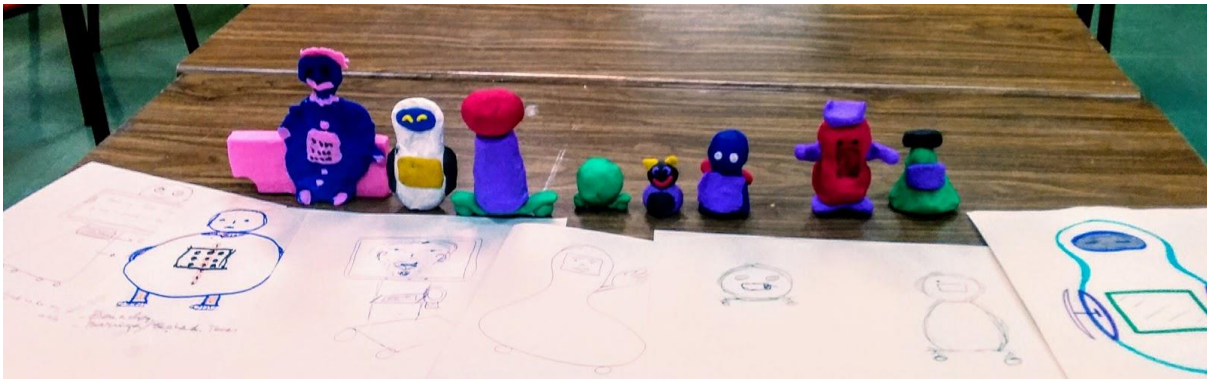


Figure 12 Co-design session material

A first call with CLARK and BOR took place in May to have a first discussion on CLARK's point of view concerning common KPIs for Phase II. Discussions continued with TUM and BOR when Phase II officially began. A first official monitoring call was organized in late summer to receive an update on CLARK's progress, which was evaluated positively. The new robot prototype was ready for testing on November 1st,

2017. The outcomes of the testing reported by CLARK in a second monitoring call, joined by external reviewer Andreas Müller, revolved around the ability of patients to interact with new technology. CLARK added a pre-test phase, to adjust testing procedures to the variability between test-subjects in terms of technology acceptance and willingness to engage. In later stages of Phase II, CLARK will focus on testing and tuning this pre-test, to allow the robot to continuous evaluate and adjust on the fly to the patient's needs, by e.g. adjust tone of voice, repeating information, enlarging text. Additional testing will be conducted to assess merit of the developed HMI, gather feedback on the chassis, and evaluate efficacy of the pre-test procedure.

It is clear to the monitoring team that the CLARK team is highly motivated, and their progress in Phase II has been significant. In end of Phase I, their HMI was flagged as clearly inadequate by reviewers. They have embraced this feedback, and risen to the challenge. The team's work has clearly benefitted from the PDTI structure, especially the monitoring input from multidisciplinary experts and the definition of clear KPIs. Structured progress discussions during monitoring calls has assisted them in structuring the way they approach their work, organize their workflow, and manage priorities. It is the monitoring team's belief that the PDTI experience will prove beneficial to CLARK, in particular in fostering a product- and innovation-technology-development mindset, invaluable to them in pursuing placement of their products/technology on the market, and in approaching customers or investors.

Healthcare Challenge: Progress of RTD Consortium ASSESSTRONIC in the Reporting Period

ASSESSTRONIC has demonstrated a probably more organized approach to their work, with a clear focus on product development. They followed an end-user driven approach in Phase I and developed a concept based on this. Their plan for Phase II was to implement and test this solution. ASSESSTRONIC needs, in terms of assistance from the monitoring team, are very different from those of CLARK. One of their greater challenges in Phase II was the shift in timing, which compressed development time. A first call with TUM and BOR took place in summer to discuss KPIs for Phase II. One monitoring call followed in autumn and two in December (one of which included both reviewers).

In terms of work performed in Phase II, ASSESSTRONIC needed to develop the actual interface, based on the mock-up developed in Phase I (very well received by reviewers). In addition to this, they needed to integrate and test their mobile robotic platform. The approach pursued was different from CLARK's, placing a greater emphasis on modularity, as opposed to the more monolithic platform of CLARK. Based on test results in Phase II, they adjusted their mobility solution, while retaining modularity. The current platform includes,

1. **Perception box**: Sensors and processing for get-up-and-go-test (Kinect camera and PC).
2. **Interface/tablet**: For an app-based interface. The end-used is able to parallelize testing through the use different tablets for different patients.
3. **Mobility solution**: Off-the-shelf mobile robotic platform (transporting the perception box). At concept stage in Phase I, the perception box was integrated within a custom-designed, mobility device. This change of orientation is presented as cost-neutral for a mobile system. The user is however free to rely only on the perception box and interface app (placing the box by hand).

The change of orientation in the manner in which the team handles mobility is such that, in some configurations (specifically, tablet plus perception box, exclusively), the developed system cannot be character-

ized as robotic. Whether or not the work performed remained within the scope of ECHORD++ (a Technology Transfer project in *robotics*), was openly discussed with the monitoring team and external experts. The conclusion was that the product developed builds upon technology from several areas relevant to robotics (perception, HMI, ICT), and that, generally, it would prove counterproductive to artificially enforce strict robotic qualities to the system (e.g. making locomotion mandatory). The constraint could lead to a worse (less cost-effective, less attractive) product. In the opinion of the monitoring team, the work conducted very much remains within the scope of the project, and the RTD team was comforted in their design choices.

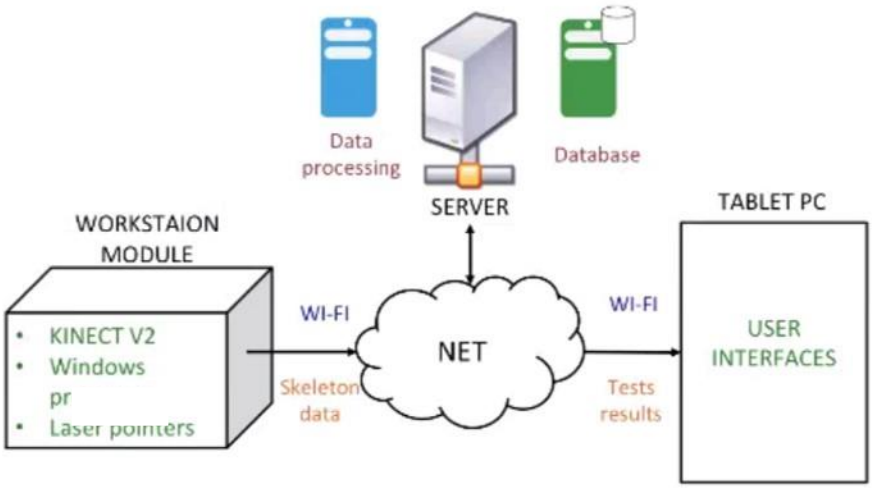


Figure 13 Current system architecture for ASSESSTRONIC

The next steps for ASSESSTRONIC are to test the different components in a lab environment, integrate them, and test the integrated system, in particular with patients, towards the end of Phase II. ASSESSTRONIC demonstrated a carefully thought out development approach in both Phase I and II. Monitoring calls in Phase II have served more as a reminder to discuss their plans and to motivate them to actively challenge themselves to set out ambitious goals.

Healthcare Challenge: Perspective towards the 5th Reporting Period

Phase II will end in March 2018, with a final evaluation scheduled to take place on February 28th 2018 at the public end-user Hospital Sant Antoni Abbat, in Vilanove i la Geltru. Based on the last monitoring call, the reviewers and the monitoring team are optimistic that the two teams will achieve their goals and meet the requirements to proceed to Phase III, which will begin on April 1st 2018.

Urban Challenge: Context and timing of activities in the Reporting Period

The final evaluation of the Phase I on June 6th, 2016, led to suggestions to the consortia for Phase II, to improve the first prototype developed and the technological solutions proposed. The document "Evaluation results and recommendations of Phase I" was sent to the consortia in August of 2016. Phase II of the PDTI Sewer had a duration of 12 months. It began on September 15th, 2016, and finished on September 15th, 2017. In November 15th 2016, a kick-off meeting took place. It served as an occasion to explain to the consortia the monitoring process and the evaluation criteria elaborated by the public entity (BCASA) and the monitoring team (UPC). The final tests and the expert evaluation at the end of phase II were conducted on October 16th-17th, 2017.

Urban Challenge: Monitoring and evaluation process for Phase II

The document "Utility infrastructures and condition monitoring for sewer network. Robots for the inspection and the clearance of the sewer network in cities. Evaluation Criteria Phase II" was elaborated by BCASA and UPC, and presented to the consortia at the kick off meeting. Phase II was divided into four monitoring periods. At the end of each one of these periods, documentation and tests were required of the consortia to describe and illustrate progress. Discussions between the public entity (BCASA), the monitoring team (UPC), and both consortia have focused on aspects related to prototypes' development and optimization of the operational procedure. The four periods can be summarized as follows,

1st Monitoring Period: 15/09/2016- 15/12/2016

At the kick off meeting (November 15th 2016, Barcelona, Spain), BCASA, UPC, and TUM gave an explanation of the monitoring process, the evaluation criteria, the dissemination activities and the required deliverables for this phase. A closing monitoring telco was conducted on December 15th, 2016. At the conclusion of the period, deliverables D26/28-3 were received.

2nd Monitoring Period: 15/12/2016-30/03/2017

On March 15th 2017, the monitoring team visited the ARSI consortium for a demonstration of the developed prototype (autonomy test) on premises of EURECAT, in Cerdanyola del Valles, Barcelona. A similar event was organized for SIAR on March 30th 2017**,** in Pablo Olavide University, Sevilla.

3rd Monitoring Period: 30/03/2017-15/06/2017

The third monitoring period was concluded with a monitoring telco on June 15th 2017, and deliverables D26/28.4-5.

4th Monitoring Period: 15/06/2017-30/09/2017

The consortia provided the Final deliverables Phase II D26.6 / D26.7 / D26.8 at the conclusion of the fourth monitoring period, in September 2017. Final evaluation of Phase for the Urban Challenge II, including demonstrations and expert panel evaluation, was performed shortly after this period, on October 16th-17th 2017**.**

The evaluation of consortia performance at the end of the Phase II was based on marks given in the three areas of: 1) Scientific and/or technological excellence, 2) Quality and efficiency of the implementation and the management of the project, and 3) Potential Impact through the development, dissemination and use of the project (in short: Excellence, implementation, impact). Evaluation is based on the following material and aspects.

1. **Positive evaluation of the tasks and documentation required during the period:** The consortia sent by email the required documents and deliverables on the dates programmed.
2. **Prototypes**: Both consortia developed new prototypes during Phase II. Deliverables D26/28-3 describe the "Changes and Improvements in mobility, autonomy and communications functionalities and technological devices for the inspection and clearance of the sewer network in cities" proposed by the consortia after the evaluation and comments of phase I. These improvements were implemented in the first prototype used in phase I and in a second prototype used at the end of phase II. The deliverables D26/5-6-7-8 and D28/-5-6 describe the prototypes' improvements.

Figure 14 Prototypes developed, ARSI (left) and SIAR (right)

3. **Operational procedures: BCASA offered during all the period (12 months) open trials for testing the** prototypes within the operational environment, the Barcelona sewer network. As it happened in Phase I, both consortia tested their prototypes on site on several occasions, with the human support of the BCASA's brigades required for the sewer operational procedure. At the beginning of Phase II, the public entity explained the importance of developing a robot that matches the functions required for a complete inspection and maintenance of the sewer network. Moreover, operation of the robotic prototype had necessarily to comply with established operational procedure followed by the brigade. Deliverables D26-4 and D28-4 describe the prototypes' operational procedure, including logistics required and operational issues. The deliverables were presented and discussed at the end of the 3rd monitoring period on June 15th, 2017.
4. **On-site testing and demonstration**: Tests were organized to allow both consortia to assess efficacy of robotic solutions developed. For the purpose of the final Phase II evaluation, time allowed to inspect the sewer area under consideration (with a length of about 640m), including setup and disassembly was limited to 6h. Location of this final test was the surroundings of the Cultural Centre of Mercat del Born that includes Comercial Street, Passeig Picasso, Ribera Street, Passatge Mercantil, and Fusina Street. Geographic Information System (GIS) data of the considered sewer sections was made available to the consortia, including sewer section types, and location of permanent obstacles (singularities). The following table shows the updated functionalities detailed in the Challenge Brief and the relative importance they are afforded (weight).

Table 8 Sewer Inspection functionalities detailed in the challenge brief

FUNCTIONS			WEIGHT
Sewer serviceability	Sewer performance 1000 lineal meter/labour day)		Crucial
	Images (Video)		Crucial
	Geometric analysis (scanning)		Crucial
	Monitoring	Air	Interesting

in-spec-tion		Water	Interesting
Structural defect inspection			Interesting
Sampling			Interesting

The consortia prototypes arrived to the Barcelona sewer location the week before the date of the final demonstration. A slot of 6 hours was given to each consortium for the final tests. Six different sewer section types were present in the area used. Irregular obstacles were present, including sedimentary accumulations in lower areas, and tubes/conduits from the ceiling.

Figure 15 The ARSI team on the day of the final evaluation (left), prototype in operation (right).

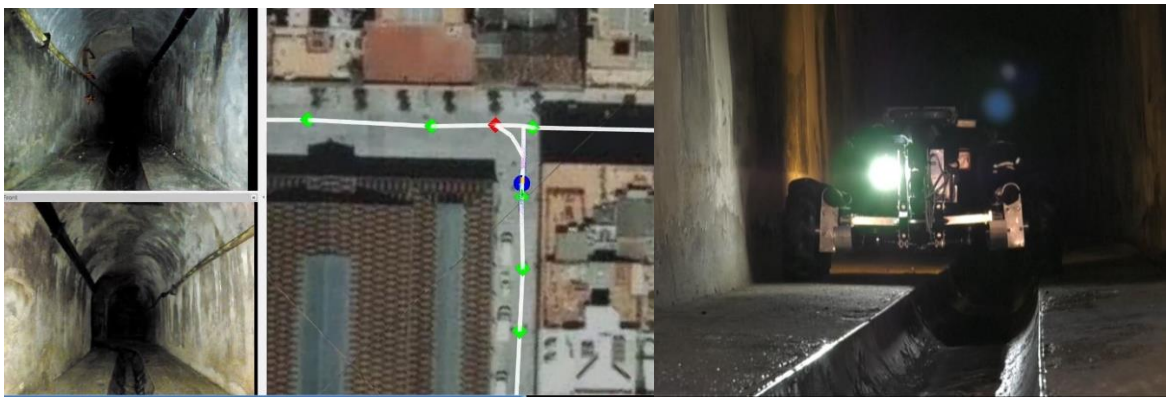


Figure 16 Data capture from the SIAR team on evaluation day (left), prototype in operation (right).

5. **Economic viability of developed products:** As discussed in the document "Evaluation criteria Phase II," the aim of a PDTI is to improve the functionalities and /or to reduce the cost of a public service, financing research and development of a pre-commercial product. The work performed should develop the economic viability for the future companies and institutions involved, including SME intent on bringing the robotic product on the market, the logistic service company, and the public entity. To illustrate this, the RTD consortia were made to provide the expected operational cost per meter of sewer serviceability inspection (over 1.000.000 meters); the cost per meter of structural defect inspection (over 1.000.000

meters), and the cost per sampling (50 samples/year). Both consortia discussed the economic viability of their product in their deliverables**.** In particular, ARSI presented the economic feasibility and their business plan in deliverable D26.2 at the end of Phase I. The deliverable includes a business plan for each partner involved. SIAR provided deliverable D28.8 (Impact and Exploitation) at the end of Phase II, which includes detailed information on economic viability, scalability, and transferability to others domains.

Urban Challenge: Performance of consortia and outcome of Phase II final evaluation

At the Expert Panel held on October 17th 2017, the two external experts, Tjibbe Bouma and Ivan Olivella, evaluated the progress of the robotic solutions. Both consortia achieved the technological requirements of autonomy, mobility and communication, making possible the operational procedure for the robotic inspection of the serviceability of the sewer network. The results and marks from the experts were included in the document "PDTI Sewer Phase II. Final Report." Respective strengths and weaknesses of both consortia's prototypes reflected to a large extent the nature of the two very different technological strategies pursued. ARSI has made the choice of using Unmanned Aerial Vehicles (specifically, quadrotors) to address the problem. This solution is proving very agile, having no problem in safely, autonomously navigating sewer sections. Power autonomy is a limiting factor however. In particular, limited flight times (of the order of 10min) require frequent recovery and redeployment of the system, which significantly complicates operational procedures. In addition, weight constraints also limit the range of sensors that can be carried onboard, negatively affecting quality of monitoring data collected. Conversely, SIAR relies on a wheeled solution (six-wheel Unmanned Ground Vehicle). The result is a system with excellent power autonomy (about four hours), able to carry a complete suite of sensors, better able to capture data relevant to the monitoring task. The solution faces challenges in terms of agility. The propulsion solution developed includes a mechanism allowing to adjust axle-width (wheel-to-wheel distance, across the vehicle's longitudinal axis of symmetry) at run-time. This function allows adjustment of the vehicle to different types of sewer sections. It also finds use in situations in which the vehicle must traverse uneven ground (e.g. negotiating a fork in the sewer system). Traversal efficacy of the vehicle has made strides since Phase I. It however remains a limiting factor, and the system had to be manually recovered on several occasions during final evaluation demonstrations. Both experts pointed out the progress made by both consortia since Phase I, which they qualified as remarkable. In addition, the consensus was that both consortia were successful in achieving objectives set for Phase II, and thus qualified for Phase III, as discussed in the Panel Evaluation report.

Urban Challenge: Perspective towards the 5th Reporting Period

Phase III of the PDTI Urban Challenge, corresponding to task T5.9: Small-scale test series, has begun on December 15th, 2017. A document describing Evaluation Criteria and the Monitoring Process for this phase has been elaborated by BCASA and UPC and sent to the consortia. A detailed description of work for each consortium has been elaborated for this phase. A kick-off Telco with the consortia has been scheduled for January 2018, to discuss the monitoring process and evaluation criteria proposed. Several tests in different sections of the sewer network will be required of the prototypes in order to get a pre-commercial product at the end of phase III. In addition, the consortia will develop a marketing strategy that will include contacts with several European cities to propose a Public Procurement for Innovation (PPI) procedure at the end of this phase.

2.2.5: Work Package 6: Structured Dialogue and Outreach Centre

Task 6.1: Overall outreach and communication planning

The action plan for outreach and communication was updated during the reporting period. The consortium paid special attention to communicate the methodology of the project and the products that have been developed.

Task 6.2: Representation E++ at workshops, conferences, etc. & Task 6.3: Organisation of major fairs and events

During the fourth reporting period the ECHORD++ consortium has been involved in a large number of dissemination activities. We were able to further disseminate the achievements of the different ECHORD++ instruments and the project's value for boosting robotic technology. The ECHORD++ partners have not only participated in international conferences, fairs and workshops showcasing ECHORD++ as a whole, but have also organized their own activities dedicated to the relevant target audiences.

In total, 14 prototypes developed in the experiments and PDTI were shown at international trade shows and conferences, in particular the Global Robot Expo (Madrid, February), Hannover Messe (Hannover, April), Innorobo (Paris, May) and the Smart City World Congress (Barcelona, November). Two international workshops were organized at the European Robotics Forum (Edinburgh, March) and at the Smart City World Congress. The first focused on the agricultural and food robotics' scenario, the second included an open consultation on "encouraging cities to innovate through robotics". Moreover, on several occasions the core partners presented the scientific findings and the innovative solutions developed in ECHORD++, e.g. at the Global Robot Congress (Madrid, February), and the FIABCI World Congress (Andorra, May). An open workshop was developed for the general public and end-users at the major event "Festa de la Ciencia" (Barcelona, June) to show future robotic solutions for solving challenges in urban robotics with a large societal impact.

All these events involved potential customers and end-users in order to investigate the marketability of the new technological solutions.

In the area of "methodology selling" representatives of ECHORD++ have presented the project's methodology at four major events: first, the "Smart Regions with Smart Robots" event, taking place on May 10 in Brussels. Paolo Dario, Chris Melhuish, Alberto Sanfeliu and Christophe Leroux presented the "RIF methodology" to representatives from local, regional and national authorities. Second, on September 14 Geoff Pegman followed an invitation of the Research Council of Norway to share know-how from ECHORD++ with potential applicants for DIHs from Norwegian industry and academia at an event named "Hubs, Platforms and Pilots in Horizon 2020". Third, upon recommendation of the EC Marie-Luise Neitz has been invited to a workshop in Brussels on "financing and sustainability of collaboration networks". Fourth, at the central event of the European Robotics Week 2017 (November 20, Brussels) Ana Puig-Pey and Franziska Kirstein presented the PDTI methodology to representatives from local, regional and national authorities from the European Committee of the Regions.

Figure 17 Juha Heikkilä (Head of Robotics & Artificial Intelligence Unit, European Commission), Bernd Liepert (CIO KUKA AG and President of euRobotics) and Mady Delvaux (Member of the European Parliament), Markku Markkula (President European Committee of the Regions)

Further events like the ones mentioned above are already scheduled, for example two workshops at the European Robotics Forum 2018: one on “Development & Learning from Technology Transfer Initiatives Towards Digital Innovation Hubs”, co-organised by the projects ROBOTT-NET and ECHORD++, another on “Encouraging Regions and Cities to Innovate through Robotics”, organised by UPC. Morover, the European Commission has invited us to present the services offered by ECHORD++ in their workshop with the title "EU Projects offering services: don't miss it!"

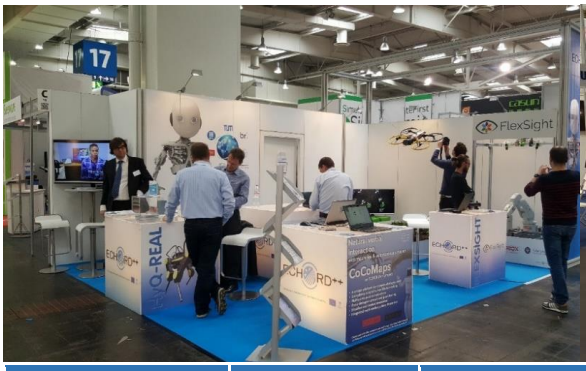
For the final reporting period we have also already secured exhibition space at the trade fairs automatica 2018 and MEDICA 2018 where we will display further prototypes developed by ECHORD++ partners. In that context it is remarkable that the technology displayed is coming mainly from experiment partners which will then already have officially finished their engagement in ECHORD++. Their commitment even beyond the runtime of the respective experiments shows the added value of exhibiting under the strong common brand ECHORD++ and is a clear sign of appreciation for the consortium’s work.

In the table below you can find a summary of the activities in WP6 during the fourth reporting period and some images of the mentioned events.

2017				
EVENT	**VENUE**	**DATE**	**ORG**	**DETAILS**
Global Robot Expo	Madrid, Spain	February 2nd – 4th	UPC	**ECHORD++ Stand. 4 prototypes. Audience: 200. Presentation by Prof. A. Sanfeliu. Audience: 70**
European Robotics Forum 2017	Edinburgh, Scotland, UK	March, 22nd – 24th	SSSA, UPC, CEA	**Workshop: Robotics for Agri-Food: ECHORD++ Experience. Audience:30**
Hannover Messe'17	Hannover, Germany	April 25th – 28th	UPC - TUM	**ECHORD++ Stand. 4 prototypes. Audience: 200**
EC Committee of Regions	Brussels, Belgium	May, 10th	UPC	**ECHORD++ booth and presentations by Paolo Dario, Chris Melhuish, Alberto Sanfeliu and Christophe Leroux. Audience: 120**
Innorobo 2017	Paris, France	May 15th – 19th	UPC - CEA	**ECHORD++ Stand. 4 prototypes. Audience: 200**
FIABCI 2017	Andorra, Andorra	May 28th	UPC	**Presentation at FIABCI Conference. Prof. Paco Sole- Parellada. Audience: 180**
Festa de la Ciencia	Barcelona, Spain	May 27th	UPC	**Urban Robotics Workshop. UPC Team. Audience: 30**
IROS 2017	Vancouver, Canada	September 25th -28th	UPC	**Preparation of ECHORD++ Final Event at IROS 2018. Activities and sponsoring**
SMART CITY WORLD CONGRESS & EXPO 2017	Barcelona, Spain	November 14th – 16th	UPC	**ECHORD++ STAND. "Encouraging cities to innovate through robotics". Audience: 200 Presentation at the SCWC' 17 PANEL: "Age-friendly cities and communities" Prof. A. Sanfeliu. Audience 100 Cities Open Consultation at the AGORA space. UPC Team. Audience 50**
European Robotics Week	Brussels, Belgium	November 20th, 2017	UPC, BOR	**ECHORD++ Booth. Audience: 30**

Global Robot Expo	Madrid, Spain	February 2nd – 4th , 2017	UPC	**ECHORD++ Stand. 4 prototypes. Presentation at the GRE Conference by Prof. A. Sanfeliu**

Hannover Messe'17	Hannover, Germany	April 25th – 28th , 2017	UPC - TUM	**ECHORD++ Stand. 4 prototypes**



Innorobo 2017	Paris, France	May 15th – 19th , 2017	UPC - CEA	**ECHORD++ Stand. 4 prototypes**

Festa de la Ciencia	Barcelona, Spain	May 27th, 2017	UPC	**Urban Robotics Workshop. UPC Team**

3. LA REVOLUCIÓ TECNOLÒGICA

Avui, costa imaginar una vida sense Internet ni telèfons mòbils, però l'escenari actual encara pot canviar molt en els propers anys. Materials com el grafè, disciplines com la nanotecnologia i la ràpida evolució dels sensors són a l'ordre del dia.

CONSTRUEIX UN SOLARIZATOR

Taller, +13 anys

A càrrec de Lina Bautista i Patricia Ubero, Familiar DIY

Dissabte: 11 h. Durada 2 hores

20 places, cal inscripció al web

ROBOTS A LA CIUTAT, QUÈ EN PENSES?

Taller, per a totes les edats

A càrrec d'Anaïs Garrell i Víctor Vilchez, Institut de Robòtica i Informàtica Industrial (IRI-UPC)

Dissabte: 13.15, 13.45 i 14.15 h

SMART CITY WORLD CONGRESS & EXPO 2017	Barcelona, Spain	November 14th – 16th	UPC	**ECHORD++ STAND. "Encouraging cities to innovate through robotics "** **Presentation at the SCWC' 17 PANEL: "Age-friendly cities and communities" Prof. A. Sanfeliu** **Cities Open Consultation at the AGORA space. UPC Team**

Task 6.4: R&D publications and project outcome announcements

As requested in the third periodic report the first annual white paper on the structured dialogue named "*Public end-user Driven Technological Innovation – PDTI. Case Study: PDTI in Urban Scenarios*" has been revised and published by UPC (ISBN: 978-84-9880-693-9). The third annual white paper focusing on the instrument of experiments has been composed by SSSA, the publication is still pending.

Furthermore, UPC has published a paper on "*Public entities driven robotic innovation in urban areas*" in the renowned journal *Robotics and Autonomous Systems* 92 (2017) by Elsevier.

2.3 Project management during the period

The project management in ECHORD++ is covered by Work Package 1, which is dedicated to the coordination of the whole project, the integration of all the work packages, the establishment of efficient management and collaboration infrastructure, the quality assurance, as well as the control of budget and spending.

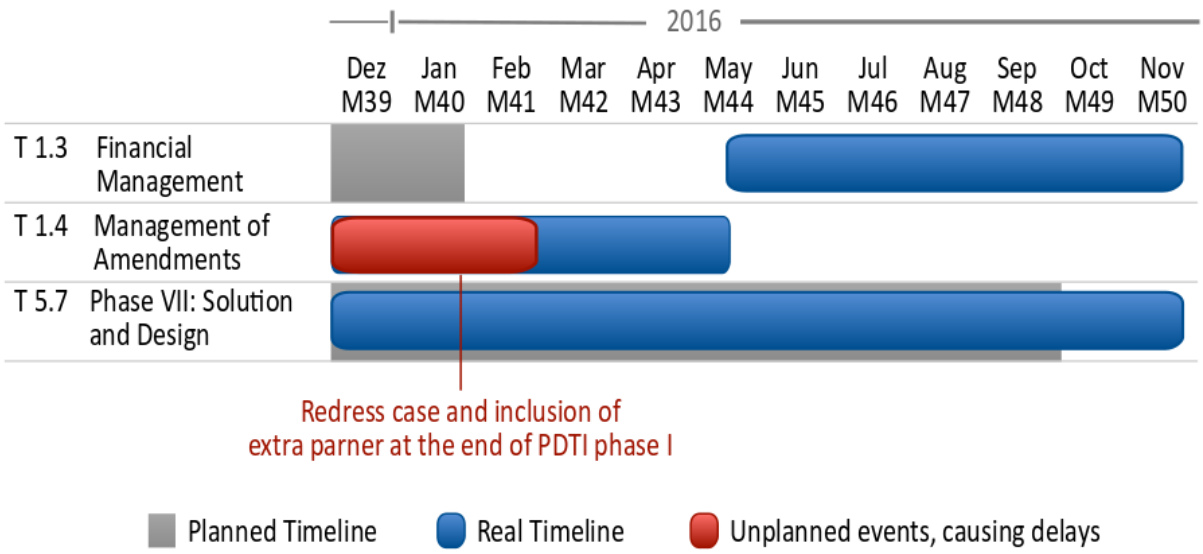


Figure 18 Analysis of the delays

As reported in the last Periodic Report, out of the three competing consortia in Phase I PDTI Healthcare, ARNICA was identified as the weakest of the three competing teams. The performance of the three projects – ARNICA, CLARK and ASSESSTRONIC - after Phase I of PDTI healthcare was evaluated by three independent experts in a physical on-site review which took place at hospital Sant Antoni Abat. The corresponding panel meeting took place in Barcelona in July 2016 (last reporting period). ARNICA thus had to leave the consortium based on the procedure outlined in the DOW of E++ and was notified of this decision mid-August 2016. ARNICA filed a redress request end of August 2016 based on a Conflict of Interest ARNICA perceived. A systematic analysis of the situation against the Conflict of Interest criteria outlined by the European Commission in the Grant Manual – Section on Proposal submission and evaluation, version 1.4., dated 28 May 2015, http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/pse/h2020-guide-pse_en.pdf, p. 11/12 was conducted by the internal redress committee.

The redress chair informed the ARNICA consortium of the result of this evaluation by mail dated 01.11.2016. The coordinator of the ARNICA consortium – ROBOSOFT – was not satisfied with the outcome of the redress report and turned to the Project Officer of E++ for support. The legal services of the European Commission have investigated the case and the Project Officer of E++ informed the ARNICA consortium by mail dated 06.12.2016 that

"Having reviewed the material received from the consortium, to the best of our knowledge, we conclude that the process implemented by the consortium complies with the internal selection procedures, agreed by all the parties involved, and mirrors the rules applied by the EC, in particular regarding the conflict of interest aspects.

In our view, the project's internal redress committee properly addressed your concerns and we have no reasons to revoke their analysis."

Consequently, ROBOSOFT's participation in E++ was terminated retroactively, with a retroactive termination date of 15.08.2016, via Amendment no. 5 to the Grant Agreement.

It has since then come to light that ROBOSOFT has undergone bankruptcy. ROBOSOFT never officially notified E++ of their bankruptcy.

Out of the two remaining healthcare teams, ASSESTRONIC got very positive feedback from the reviewers after Phase I, while the CLARK consortium was requested to significantly increase the involvement of the end-user in the set-up of the technological solution and to integrate acceptability in the design phase already. CLARK was asked to tackle this point by including an additional partner in their consortium (without increasing their budget) and to systematically tackle of the weak points revealed during the on-site review in a systematic approach. This led to a good performance during Phase II (see section XXX of this report) and at the same time delayed the submission of the Amendment V to initiate Phase II of healthcare.

In order to allow the two selected PDTI urban robotics teams to start Phase II in a timely manner, the E++ coordinator TUM had to separate the start dates of PDTI Phase in urban robotics from the healthcare and squeeze in yet another amendment to do so.

The delay of Amendment V (PDTI sewer waiting for PHTI healthcare to catch up despite the redress and the inclusion of a new partner) as well as the additional amendment (to then initiate Phase II of PDTI healthcare) delayed the submission of the cost claim. The E++ coordinating team had to collect the financial data of all 100 partners offline first to provide the necessary overview of the financial services of the EC and then had to collect the electronic version (Cost Claim via NEF system in Form Cs of all the partners) on top. The Cost Claim was then submitted in Mai 2017 (instead of end of January 2017).

In terms of strategic KPIs, E++ performed well (and has optimized its processes over time to do so): The coordination team performs well in all disciplines which are under their own control (for instance time spans met once the NEF system is open) and fails in cases where the performance depends on external factors (like electronic submission tools blocked). In addition, performance was again strong in the traditionally performing disciplines like networking and SME attraction.

Task 1.1: Overall Project Management

Coordination at PI level worked well during the reporting period. Apart from informal bi-lateral meetings between the coordinator and members of the Coordination Committee, we had one official meeting of the **Coordination Committee**: in July 2017 in Barcelona. Also, the annual **Advisory Board Meeting** took place. The discussions that took place were largely centred on technology transfer to SMEs, the link between those and the large companies and how this was done in the different non-European countries around the table. Infrastructure programs were again a topic dis and its recommendations have already been largely implemented. The main instrument, though, driving a very intensive collaboration between the members of the core consortium, was bi-lateral skype meetings in WP3, WP4 and WP5 between TUM and the WP leader (WP3), the RIF owners within E++ (Bristol, CEA and SSSA) as well as in WP 5 BOR (healthcare) and UPC (urban robotics).

Particularly also in the area of experiment monitoring this period has been very active and productive. The management of underperforming experiments as well as the sharing of best practice was heavily improved (see section 2.2.2 of this report).

Task 1.2: Quality Management

An assessment of the project's performance against pre-defined targets is given in Annex 1.

In spite of the above delay issues (see *Figure 18*), if we were not able to meet the originally established performance objectives, we still were able to achieve reasonable levels of performance as described by the QM KPIs. When possible, we took measures as best as possible to mitigate the negative effect of these delays. For instance, flexibility in the starting date of PDTI healthcare (in order not to risk the performance in PDTI urban robotics).

Following reviewers' recommendations, the monitoring of **Experiments** has used a traffic light format to represent each Experiment's status (see Section 2.2.2.). This format allows for a single-page, synthetic overview of performance of the entire Call 1 (used in monitoring deliverables D3.5.4 and D3.5.5.). In complement, a more detailed traffic-light document was produced, describing with the same traffic-light representation the status of all KPIs, Deliverables and Milestones of each Experiment (found in the six-monthly QM reports D1.2.7 and D1.2.8). Yellow traffic lights in experiments were mainly caused by delays, while the general outlook for the majority of the experiments is fairly positive. The monitoring team is optimistic that 14 out of the 16 Call II experiments will meet the targets at the end (some with a cost-neutral extension of their runtime). Only one experiment – CoCoMaps and Flexsight – seem to be in severe trouble.

A set of specific performance indicators had initially been proposed for **RIFs**. Performance against these target values was checked constantly during this reporting period so that performance tracking became really operational. Despite several attempts, however, it was impossible for the coordination team to directly interview RIF users to collect their direct feedback on the benefits they gained from using the RIF. The failure in directly interfacing with the RIF users for anybody other than the RIF owner who signed the contract with them was mainly motivated by data protection. Results of the aforementioned discussion on RIF performance assessment, including selected performance indicators, can be found in the six-monthly QM reports D1.2.7 and D1.2.8.

Finding a common set of KPIs for PDTI sewer and healthcare was particularly challenging as the same set of KPIs need to be applicable to the two competing teams in healthcare and sewer respectively, despite

their diverting approach on solving the challenge. UPC decided to work with a set of deliverables which was the same for both teams, while BOR and TUM worked on a common set of KPIs for healthcare which were negotiated with both teams and the public body involved in parallel. In both cases the teams showed good performance against the targets. PDTI Urban robotics (sewer) already entered Phase III, while healthcare will have its on-site review in February 2018, but monitoring shows positive trends for both of them.

Overall, the **dissemination and outreach activities** of ECHORD++ were very successful and resulted in a high visibility of the project. The performance of the online channels (website and social media) exceeded expectations. The number of references in the media has already almost reached the target value set for the end of the project, mainly because of increased activities from experiment and PDTI consortia. However, the project encountered difficulties in getting media coverage from large national and international print media (as requested in the reviewers' recommendations of the last reporting period). Although we contacted a large number of these media asking them to report on E++, their feedback was rather negative (further details provided in section 2.2.1 of this report).

The attendance to workshops, conferences and especially trade fairs was beyond expectations.

The quality assessment of all deliverables of the core consortium due during this reporting period was done as a team effort by the core partners involved in the different activity lines (experiments, PDTI and RIFs).

Task 1.3: Financial Management

The total grant of ECHORD++ amounts to 19.750.000 €. A pre-funding of 8.920.000 € was granted to the project. Retaining 5% of the maximum total grant for the security fund, the pre-funding physically transferred to the coordinator's account amounted to 7.932.500 €. After **pre-funding** the core consortium (1.957.109 €), the Call I experiments (2.375.159 €), the Call II experiments (total: 2.456.351 €), the PDTI public bodies (total 169.252), the PDTI consortia for Phase I (143.390 €) and Phase II (439.659 €). The remaining pre-funding of 391.580 € will be sufficient to cover the pre-funding of PDTI Phase III.

The financial statements for RP III were submitted in the NEF on 22/09/17 and were accepted on 13/12/17. The interim payment process is currently ongoing and will be shortly closed.

The total grant of ECHORD++ amounts to 19.750.000 €. A pre-funding of 8.920.000 € was granted to the project. Retaining 5% of the maximum total grant for the security fund, the pre-funding physically transferred to the coordinator's account amounted to 7.932.500 €. After **pre-funding** the core consortium (in total: 1.957.109 €), the Call I experiments (total: 2.534.519 €), the Call II experiments (total: 2.456.351 €), the PDTI public bodies (total: 169.252 €) and the PDTI Phase I consortia (total: 143.390 €), the remaining pre-funding of 671.879 € will be sufficient to cover the pre-funding of PDTI Phases II and Phases III.

All **Cost Claims** geared to RPII were paid as accepted by the EC within 14 days after the overall Cost Claim was accepted.

Task 1.4: Management of Amendments

Amendment V was performed during this reporting period. This amendment included the following topics:

PDTI:

1) Budget shift from TUM to the remaining four PDTI consortia (ARSI, SIAR, CARK, ASSESSTRONIC) to start Phase II of PDTI.
2) Termination of the partners involved in ROBODILLOS and ARNICA (failing teams PDTI Urban Robotics and PDTI healthcare after Phase I)
3) Inclusion of one new partner – Activeageing (UTT). This step was the result of the on-site review of PDTI healthcare and is necessary to better integrate the user perspective in the technology development of this consortium. The selection was based on a matrix with criteria, one independent expert with the corresponding background made some suggestions, others came from the core consortium, some are from desktop research of the CLARK consortium.
4) Changed PDTI deliverables of the core consortium to better align with the different Phases of PDTI (we will remember your remark to make sure that the end-user perspective is adequately reflected in these deliverables) and the deliverables of the PDTI consortia for their Phase II activities.

Use of remaining experiment budget:

5) The Amendment also includes budget shifts from the remaining experiment budget (due to the termination of the ROAR experiment of Call I) to: to members of the core consortium to finance additional activities to the benefit of the RIFs and the experiments as detailed in the attached excel sheet.

    a. These measures include a workshop in St. Gallen for experiments to boost their commercialization.
    b. These budget shifts also include the increase of personnel budget for BOR who will do the remote monitoring of PDTI healthcare, particularly CLARK. This monitoring needs scientists with a healthcare background in different areas and with different foci. These are located at BOR. These budget shifts also include the increase of the personnel costs for partner BRL to extend the contract of the RIF marketing manager at E++. Last but not least a slight increase of travel budget for partner UPC to do the on-site reviews of E++ experiments together with independent experts.
    c. A remaining budget of 263.634,18 € (EU funding) is allocated to the experiment booster to lift selected experiments to commercialization. This booster will be outlined in detail in section XXX of this report. It will start in February 2018.

Cost-neutral extension of the runtime of E++ by 4 months

As discussed during the last review meeting, a cost –neutral extension of the project's runtime was requested and granted. E++ will now end in January 2019.

3. Deliverables and milestones tables

Deliverables table

No.	Name	WP No.	Nature	Delivery date from Annex I	Actual/ Forecast delivery date	Planned effort (from Annex I)	Comments
D1.1	Project Plan	1	0	31.10.13	Version 1: 30.09.13 Version 2: 18.06.15	17	Not due in this reporting period.
D1.2.1	1st six- Monthly QM Report	1	R	31.03.14	29.05.14	1.5	Not due in this reporting period.
D1.2.2	2nd six- Monthly QM Report	1	R	30.09.14	30.09.14	1.5	Not due in this reporting period.
D1.2.3	3rd six- Monthly QM Report	1	R	31.03.15	30.06.15	1.5	Not due in this reporting period.
D1.2.4.	4th six-Monthly QM Report	1	R	30.09.15	30.09.15	1,5	The report was provided on time, and then updated three times in order to reflect the entire Amendment III from submission to approval in this report.
D.1.2.5.	5th six-Monthly QM Report	1	R	31.03.16	31.03.16	1,5	The report was provided on time, but then updated three times in order to cover the entire Cost Claim from opening of the NEF to approval in order to report on the strategic KPIs related to this.
D1.2.6.	6th six-Monthly QM Report	1	R	30.09.16	07.10.16	1,5	The report was submitted with a slight delay, but then updated four times in order to cover the entire Amendment IV (inclusion of Call II experiments) and report on all strategic KPIs related to this.
D1.2.7.	7th six-Monthly QM Report	1	R	31.03.2017	31.03.2017 / 30.05.2017	1,5	The report was submitted on time, but then update two months later in order to include the accepted Amendment V
D1.2.8.	8th six-Monthly QM Report	1	R	30.09.2017	09.10.2017 / 24.01.2018	1,5	The report was submitted with a slight delay, and then updated to include an overview of the experiment extensions.
D1.3.1	1st Periodic Report	1	R	31.05.14	02.06.14	2	Not due in this reporting period
D1.3.2.	2nd Periodic Report	1	R	30.07.15	30.07.15	3	Not related to this reporting period.
D1.3.3.	3rd Periodic Report	1	R	29.01.17	30.01.17	3	The report was submitted with one day of delay. The submission had to be done offline as the NEF system was blocked with an amendment. The official submission via the NEF system took then place in June 2017.

D1.3.4.	4th Periodic Report	1	R	29.01.2017	29.01.2017	3	The periodic Reports is submitted on time. Again, this needs to be offline first as the NEF system is block with the Amendment VI t include PDTI sewer inspection for Phase III.
D1.4.1	Amendment request 1	1	O	unplanned	18.06.2015	unplanned	Not due in this reporting period.
D1.4.2.	Amendment Request 2	1	O	30.10.14	30.06.15	2	Inclusion of Call I partners and PDTI public bodies. Originally planned as Amendment 1. Delayed because of unplanned Amendment D1.4.1. which took a long time due to validation of Blue Ocean Robotics. Then the first Cost Claim had to be processed. 8 months delay.
D1.4.3.	Amendment Request 3	1	O	Not planned	26.01.16	unplanned	Inclusion of PDTI RTD consortia for Phase I. Original plan (with just two PDTI phases and four competing consortia instead of six) was to combine this with the inclusion of Call II experiment partners.
D1.4.4.	Amendment Request 4	1	O	30.03.16	28.11.16	3	Inclusion of Call II experiment partners. This Amendment was originally planned as Amendment 2 to include the experiment Call II partners and the PDTI Phase I partners together. Still 8 months delay caused by D1.4.1. which was unplanned.
D1.4.5.	Amendment Request 5	1	O	31.03.2017	22.05.2017	3	This amendment was originally planned as amendment 3 to reduce the PDTI consortia from two competing teams to 1 team per challenge. Now Amendment 5 covered the transition of the competing PDTI teams for Urban Robotics and Healthcare from Phase I to Phase II and the corresponding reduction of teams from three competing teams per challenge to 2 competing teams.
D2.1.1	1st Customer Satisfaction Survey	2	R	30.09.14	30.09.14	16.20	Not due in this reporting period.
D2.1.2.	2nd Customer Satisfaction Survey	2	R	30.09.15	30.09.15	16.20	Not due in this reporting period.
D.2.1.3.	3rd Customer Satisfaction Survey	2	R	30.09.16	30.01.17	16.30	Evaluations done on time (30.09.16), but analysis done in January 2017. Call 2 Applicant Satisfaction Survey, PDTI Applicant Satisfaction Survey.
D2.1.4.	4th Customer Satisfaction Survey	2	R	30.09.2017	30.09.2017	16.30	Was delivered on time. Evaluation was done among the Call 2 experiments.
D2.2	Project Website	2	0	30.11.13	31.10.13	9.5	Not due in this reporting period.
D2.3	Communication Plan	2	R	31.12.13	21.02.14	4	Not due in this reporting period.
D2.4	Contact data base	2	R	.30.11.13	08.5.14	4	Not due in this reporting period.

D2.5	First set of PR-related material including presentations	2	R	31.12.13	28.02.14	8	Not due in this reporting period.
D3.1	Collection of guidelines, templates, and supporting documents	2	R	28.2.14	04.04.14	3	Not due in this reporting period.
D3.2	Report on information events and coaching activities	2	R	31.3.14	31.3.14	9	Not due in this reporting period.
D3.3.1	Call texts	2	0	28.2.14	10.03.14	2	Not due in this reporting period.
D3.3.2	Call texts	3	0	31.07.15	07.05.15	2	Not due in this reporting period.
D3.4.1	Collection of documents with final ranking, evaluation reports, statistics, and funding suggestion	3	R	31.07.14	14.08.14	4	Not due in this reporting period.
D3.4.2.	Collection of documents with final ranking, evaluation reports, statistics, and funding suggestion.	3	R	31.12.15	05.02.16	4	The panel meeting took place in October 2015 and the preparation of the statistical data took some more time.
3.5.2.	2nd six-monthly report on experiment progress and reviews	3	R	31.12.15	31.08.16	6	The report was delayed due to fixing the monitoring platform and the negotiations and KPI document development with all the experiments.
3.5.3.	3rd six-monthly report on experiment progress and reviews	3	R	31.08.16	31.08.16	6	
3.5.4.	4th six-monthly report on experiment progress and reviews	3	R	30/04/2017	26/05/2017	6	The report was submitted with a slight delay. The deliverable does not respect the deliverable template which is to be used for E++ deliverables. Layout needs to be updated (front page).
3.5.5.	5th six-monthly report on experiment progress and reviews	3	R	31/10/2017	31/10/2017	6	The report was submitted on time. The deliverable does not respect the deliverable template which is to be used for E++ deliverables. Layout needs to be updated (front page).
3.6.1.	Final report on the outcome of the experiments Call I	3	R	30.11.16	27.01.17	10	The report was delayed in order to integrate as many final on-site review results as possible.
D4.1	Operational Handbook	4	R	28.2.14	28.2.14 Version 14: 26.08.15	5.5	Not due in this reporting period.

D4.2	Report on set-up phase	4	R	30.09.14	10.12.14	5.5	Not due in this reporting period.
D4.3.1	Report 1 on selection /prioritisation and user schedules	4	R	30.09.14	30.06.15	0.9	Not due in this reporting period.
D4.3.2.	Report 2 on selection/ prioritisation and user schedules	4	R	30.09.16	24.11.15	0.9	This deliverable was slightly delayed as it took some time to collect the consistent numbers from all three RIFs. Reporting routine of the three RIFs still under revision at that time.
D4.3.3.	Report 3 on selection /prioritisation meeting and user schedules	4	R	30.09.16	31.01.17 (draft on 24/01/17)	0.9	This deliverable was submitted outside of the reporting period and slightly after the due date of the submission of this periodic report. A draft, though, was sent 24/01/17 after a physical meeting in Munich on the recording of relevant data in the three RIFs and the processes standing behind this, all three RIFs being embedded in different organizational set-ups (internal) and different eco-systems (external).
D4.3.4.	Report 4 on selection /prioritisation meeting and user schedules	4	R	30.09.2017	30.09.2017	0.9	
D4.4.1.	Report 1 on the outcome of the individual RIFs	4	R	30.09.15	24.11.15	63.75	This deliverable was slightly delayed as it took some time to collect the consistent numbers from all three RIFs. Reporting routine of the three RIFs still under revision at that time.
D4.4.2.	Report 2 on the outcome of the individual RIFs	4	R	30.09.16	31.01.17 (draft on 24.01.17)	63.75	This deliverable was submitted outside of the reporting period and slightly after the due date of the submission of this periodic report. Again, the evaluation matrix of the three RIFs was intensively discussed during a physical meeting in Munich, as the RIFs are embedded in different environments internal (company structure and culture) and external (eco-system).
D4.4.3.	Report 2 on the outcome of the individual RIFs	4	R	30.09.2017	30.09.2017	63.75	
D4.5.	Revised operational handbook			30.09.2015	Draft sent December 2016	4	The handbook was revised and re-submitted after the review meeting at reporting period 1. The latest version of the continuously updated handbook has been submitted outside of the reporting period and slightly after the due date of the submission of this Periodic Report.
D5.1	Operational Handbook	5	R	28.02.14	Version 1:	7	Not due in this reporting period,

					28.01.14 Version 5: 25.08.15		
D5.2	List with the public bodies interested in participating and their proposals as input for the evaluation	5	R	31.07.2014	Version 1: 31.05.14 Version 2: 30.09.14	7	Not due in this reporting period.
D5.3.	PDTI: Open Call and selection of RTD consortia	5	R	30.09.2015	30.09.16	23.5	This deliverable covers the activities for the preparation of the Open Call – from the development of the Challenge Briefs for healthcare and urban robotics, the launch and re-launch of the calls, as well as the selection with the evaluation and the panel meetings. Despite the relaunch the deliverable was provided on time.
D5.4.	Phase I - Design Phase: Selection of the two winning teams for Phase II	5	R	31.03.2016	31.03.16	8	The first version of the deliverable was provided as scheduled, but then it needed revision to include the outcome of the actual on-site testing and the panel meetings. Another revision was done after the redress was closed for healthcare.
D6.1	Action plan for communication / PR measures	6	R	31.12.13	Version 1 31.12.13 Version 2 08.05.14	4	Communication plan is updated annually.
6.2.1.	1st Annual White paper on the structured dialogue	6	R	30.09.15	31.12.16	9	This White paper is focused on PDTI. It was continuously updated t follow the process and completed then in December 2016 after the selection of the RTD teams was finalized. Based on the request at the last review meeting, this deliverable was again updated and the updated version has been uploaded on the reviewers' website.
6.2.2.	2nd Annual White Paper	6	R	30.09.16	20.01.17	9	The second Annual White Paper will be replaced by an Elvesier edition on robotics for the elderly. The proposal has been submitted on 20.01.17. This is expected to have a high impact.
6.2.3.	3rd Annual White Paper	6	R	30.09.2017	October 2017	9	This deliverable is the first draft. It will be updated. This deliverable again does not respect the deliverable template of E++. The front page needs to be adjusted.

4. Explanation of the use of resources and financial statements

4.1 Financial statements and cost follow-up tables – Core consortium

TUM

WP	Activity Type	Item description	Amount	Explanations
WP1	MGT	Personnel Costs	42.100,37 €	In total 6,43 PM during the reporting period: Yannick Morel (1,99), Federica Pepponi (4,34 PM), Sebastian Weisenburger (0,10 PM).
WP2	RTD	Personnel Costs	114.812,05 €	In total 17,09 PM during the reporting period: Amy Buecherl (4,92 PM), Nicolas Kuske (0,22 PM), Anna Principato (4,10 PM), Federica Pepponi (0,56 PM), Sebastian Weisenburger (7,29 PM).
WP3	RTD	Personnel Costs	77.971,14 €	In total 10,98 PM during the reporting period: Yannick Morel (6,01 PM), Francesco Maurelli (0,38 PM), Adam Schmidt (3,83 PM), Hardik Shah (0,76 PM).
WP4	RTD	Personnel Costs	11.724,50 €	In total 1,65 PM during the reporting period (Yannick Morel).
WP5	RTD	Personnel Costs	9.515,54 €	In total 1,33 PM during the reporting period (Yannick Morel).
WP6	OTHER	Personnel Costs	5.381,09 €	In total 0,84 PM during the reporting period: Yannick Morel (0,27 PM), Adam Schmidt (0,11), Sebastian Weisenburger (0,46 PM).
Subtotal Personnel Costs			261.505 €	
WP1	MGT	Subcontracting	2.100 €	Audit for third reporting period
WP2	RTD	Subcontracting	4.165,00 €	i2M Factory, Website yearly maintenance and assistance 2017
WP3	RTD	Subcontracting	675,00 €	Andreas Müller, Indipendent expert fee, LA-ROSES evaluation, 25/07/16, Pisa
WP3	RTD	Subcontracting	68,00 €	Printing costs, business cards
WP4	RTD	Subcontracting	4.925,01 €	Filming and post-production, Paris Saclay RIF
WP4	RTD	Subcontracting	2.070,01 €	Photo shoot, Paris Saclay RIF
WP5	RTD	Subcontracting	900,00 €	Andreas Müller, Indipendent expert fee, PDTI Phase I Panel meeting and on-site testing, 06-08/07/16, Barcelona
WP5	RTD	Subcontracting	1.071,00 €	Tjibbe Bouma, Indipendent expert fee, PDTI Phase I Panel meeting and on-site testing, 06-07/07/16, Barcelona
WP5	RTD	Subcontracting	900,00 €	Alvaro Iriatre, Indipendent expert fee, PDTI Phase I Panel meeting and on-site testing, 06-07/07/16, Barcelona
WP5	RTD	Subcontracting	900,00 €	Malcolm Fisk, Indipendent expert fee, PDTI Phase I Panel meeting and on-site testing, 06-08/07/16, Barcelona
WP6	OTHER	Subcontracting	55,00 €	Printing costs

WP6	OTHER	Subcontracting	619,67 €	Printing costs, Experiments brochure 2017
WP6	OTHER	Subcontracting	62,07 €	Printing costs, Flyers Hannover Messe 2017
Subtotal Subcontracting			**18.511 €**	
WP1	MGT	Travel and Subsistence	2.713,34 €	Accomodation and travel expenses, E++ review meeting and rehearsal, 12-14/02/17, Luxembourg (Prof. Knoll, Amy Buecherl, Marie-Luise Neitz, Sebastian Weisenburger, Federica Pepponi, Yannick Morel)
WP1	MGT	Travel and Subsistence	7.958,79 €	Accomodation and travel expenses, CC and Advisory Board Meeting, 09-12/07/17, Barcelona (Prof. Knoll, Amy Buecherl, Marie-Luise Neitz, Renchyuan Luo, Hagita Norihiro)
WP1	MGT	Travel and Subsistence	344,55 €	Meeting room, E++ core consortium meeting at ERF 2017, 22/03/17, Edinburgh
WP1	MGT	Travel and Subsistence	77,12 €	Marie-Luise Neitz, Core consortium review meeting preparation, 25-26/01/17, Ismaning
WP2	RTD	Travel and Subsistence	741,27 €	Sebastian Weisenburger, E++ review meeting, 12-14/02/17, Luxembourg
WP2	RTD	Travel and Subsistence	5,60 €	Sebastian Weisenburger, PARI 2017, 29-30/05/17, Garching, Sebastian Weisenburger
WP3	RTD	Travel and Subsistence	675,00 €	Patrick van der Smagt, Indipendent expert reimbursement, DexBuddy evaluation, 28-29/07/16, Karlsruhe
WP3	RTD	Travel and Subsistence	1,20 €	Hardik Shah, Experiment on-site review, 14-15/09/16, Pisa
WP3	RTD	Travel and Subsistence	420,71 €	Andreas Müller, Indipendent expert reimbursement, LA-ROSES evaluation, 25/07/16, Pisa
WP3	RTD	Travel and Subsistence	314,82 €	Patrick van der Smagt, Indipendent expert reimbursement, DexBuddy evaluation, 28-29/07/16, Karlsruhe
WP3	RTD	Travel and Subsistence	47,60 €	Francesco Maurelli, AUTOMATICA 2016, 21-22/06/16, Munich
WP3	RTD	Travel and Subsistence	36,96 €	Francesco Maurelli, MARS on-site review, 17/11/16, Marktoberdorf
WP3	RTD	Travel and Subsistence	616,07 €	Yannick Morel, Seminar on analysis and simulation of GNC for mobile robotics, 07-09/09/16, Brest
WP3	RTD	Travel and Subsistence	284,03 €	Francesco Maurelli, GarOtics on-site review, 06/12/16, Buxtehude
WP3	RTD	Travel and Subsistence	526,40 €	Hardik Shah, LA-ROSES on-site review, 03-05/01/17, Pisa
WP3	RTD	Travel and Subsistence	97,80 €	Yannick Morel, LA-ROSES on-site review, 03-05/01/17, Pisa
WP3	RTD	Travel and Subsistence	1.201,56 €	Marie-Luise Neitz, E++ workshop and consortium meeting at European Robotics Forum 2017, 21-24/03/17, Edinburgh
WP3	RTD	Travel and Subsistence	528,38 €	Yannick Morel, EXOTrainer on-site review, 02-03/05/17, Madrid
WP3	RTD	Travel and Subsistence	1.037,82 €	Yannick Morel, 3DSSC on-site review, 09-14/02/17, Leuven
WP3	RTD	Travel and Subsistence	488,10 €	Yannick Morel, E++ workshop and consortium meeting at European Robotics Forum 2017, 21-24/03/17, Edinburgh
WP3	RTD	Travel and Subsistence	615,07 €	Adam Schmidt, Experiments monitoring meeting, 31/07-1/08/17, Pisa

WP4	RTD	Travel and Subsist-ence	1.163,90 €	Marie-Luise Neitz, I4MS Innovation Hubs meeting, 20/10/16, Brussels
WP4	RTD	Travel and Subsist-ence	156,87 €	Marie-Luise Neitz, RIF meeting, 24-28/11/16, Palma
WP4	RTD	Travel and Subsist-ence	1.885,39 €	Travel expenses reimbursement, RIF photo shoot and filming
WP4	RTD	Travel and Subsist-ence	3.569,40 €	Travel expenses reimbursement, RIF photo shoot and filming
WP4	RTD	Travel and Subsist-ence	957,27 €	Yannick Morel, E++ Workshop at ICRA 2017, 31/05-04/06/17, Singapore
WP4	RTD	Travel and Subsist-ence	259,00 €	Marsiske, E++ RIF media tour, 11-13/09/17, Pisa
WP4	RTD	Travel and Subsist-ence	272,62 €	Kassandra Perlongo, E++ RIF media tour, 11-13/09/17, Pisa
WP4	RTD	Travel and Subsist-ence	2.038,00 €	Guest accomodation and transportation, E++ RIF media tour, 11-13/09/17, Pisa
WP4	RTD	Travel and Subsist-ence	264,03 €	Hamacher Adriana, E++ RIF media tour, 11-13/09/17, Pisa
WP5	RTD	Travel and Subsist-ence	536,24 €	Andreas Müller, Indipendent expert reimbursement, PDTI Evaluation, 06-08/07/16, Barcelona
WP5	RTD	Travel and Subsist-ence	1.458,37 €	Tjibbe Bouma, Indipendent expert reimbursement, PDTI Phase I Panel meeting and on-site testing, 06-07/07/16, Barce-lona
WP5	RTD	Travel and Subsist-ence	970,65 €	Francesco Maurelli, PDTI Phase I Panel meeting and on-site testing, 05-09/07/16, Barcelona
WP5	RTD	Travel and Subsist-ence	1.950,84 €	IROS 2016, E++ workshop, 09-14/10/16, Seoul, Francesco Maurelli
WP5	RTD	Travel and Subsist-ence	3.548,86 €	IROS 2016, E++ workshop, 07-12/10/16, Seoul, Prof. Knoll
WP5	RTD	Travel and Subsist-ence	1.807,23 €	IROS 2016, E++ workshop, 07-12/10/16, Seoul, Amy Buecherl
WP5	RTD	Travel and Subsist-ence	267,30 €	Sebastian Weisenburger, PDTI PR workshop, 14-15/11/16, Barcelona
WP5	RTD	Travel and Subsist-ence	367,07 €	Malcolm Fisk, Indipendent expert reimbursement, PDTI Phase I Panel meeting and on-site testing, 06-08/07/16, Barce-lona
WP5	RTD	Travel and Subsist-ence	707,17 €	Marie-Luise Neitz, EUnited Competitiveness Review Dinner Debate, 7-9/12/16, Brussels
WP6	OTHER	Travel and Subsist-ence	1.601,97 €	Sebastian Weisenburger, Hannover Messe 2017, 23-25/04/17, Hannover
WP6	OTHER	Travel and Subsist-ence	302,35 €	Anna Principato, Hannover Messe, 25-29/04/17, Hannover
WP6	OTHER	Travel and Subsist-ence	269,64 €	Yannick Morel, Hannover Messe, 26-28/04/17, Hannover
WP6	OTHER	Travel and Subsist-ence	220,01 €	Adam Schmidt, Hannover Messe, 25-27/04/17, Hannover
Subtotal Travel & Subsistence			**43.306,37**	
WP1	MGT	Other direct costs	243,61 €	Shipping costs

WP1	MGT	Other direct costs	1.283,70 €	Catering and meeting rooms, Core consortium preparatory meeting for periodic review, 25-26/11/17, Ismaning
WP1	MGT	Other direct costs	1.050,00 €	Catering and meeting room, E++ review meeting rehearsal RP 3, 13/02/17, Luxembourg
WP1	MGT	Other direct costs	6,82 €	Catering costs, E++ review meeting revision, 07/06/17, Munich
WP1	MGT	Other direct costs	715,94 €	Catering for guests, Coordination Committee and Advisory Board meetings, 09-10/07/17, Barcelona
WP2	RTD	Other direct costs	144,00 €	DFN Verein Deutsches Forschungsnetz, annual fee 4 domains
WP2	RTD	Other direct costs	200,00 €	Registrationg Fee, PARI 2017, 29-30/05/17, Garching, Sebastian Weisenburger
WP2	RTD	Other direct costs	118,87 €	Catering for guests, Core consortium PR meeting, 20/06/17, Munich
WP2	RTD	Other direct costs	309,52 €	Catering for guests, E++ Press Tour, 12/09/17, Pisa
WP3	RTD	Other direct costs	87,45 €	Catering for guests, Call 2 Kick-Off Meeting, 04/05/16, Palma
WP4	RTD	Other direct costs	206,90 €	Catering for guests, RIF meeting, 28/11/16, Palma
WP6	OTHER	Other direct costs	21,90 €	Catering for guests, Hannover Messe, 24-28/04/17, Hannover
Subtotal Other direct costs			**4.389 €**	
WP3	RTD	Consumables	109,00 €	Keyboard
Subtotal Consumables			**109 €**	
WP2	RTD	Durable Equipment	196,28 €	Depreciation for a laptop
WP2	RTD	Durable Equipment	41,36 €	Adobe Creative Suite 6 software license
WP3	RTD	Durable Equipment	158,46 €	Depreciation for a laptop
WP3	RTD	Durable Equipment	192 €	Depreciation for a laptop
WP4	RTD	Durable Equipment	145,51 €	Depreciation of smart phone for VR glasses
Subtotal Durable Equipment			**734 €**	
TOTAL DIRECT COSTS			**328.553 €**	
	MGT	Indirect Costs	33.897 €	
	RTD	Indirect Costs	147.451 €	
	OTHER	Indirect Costs	4.678 €	
TOTAL INDIRECT COSTS			**186.025 €**	
TOTAL COSTS			**514.579 €**	
TOTAL FUNDING REQUEST (FORM C)			**412.360 €**	

CEA

WP	Activity Type	Item description	Amount	Explanations
WP1	MGT	Personnel Costs	3.214 €	Cost of personnel for a total of 0,35 PM for WP1 activities (C. Leroux)
WP2	RTD	Personnel Costs	11.786 €	Cost of personnel for a total of 1,27 PM for WP2 activities (C. Leroux)
WP3	RTD	Personnel Costs	3.214 €	Cost of personnel for a total of 0,35 PM for WP3 activities (C. Leroux)
WP4	RTD	Personnel Costs	46.659 €	Cost of personnel for a total of 9,96 PM for WP4 activities (C. Rotinat, P. Betinelli, F. Gosselin, F. Geffard, C. Bidard, A. Riwan, M.C. Seve, M. Grossard)
WP6	OTHER	Personnel Costs	17.598 €	Cost of personnel for a total of 1,89 PM for WP6 activities (C. Leroux, , Ph. Garrec, P. Betinelli)
Subtotal Personnel Costs			**82.471 €**	
WP1	MGT	Travel and Subsistence	2.826 €	C. Leroux : Munich, 24-26/01/2017, Rehearsal 3rd year ; Luxembourg, 12-14/02/2017 Review Meeting ; Barcelon, 08-11/07/2017 Réunion Board E++
WP6	OTHER	Travel and Subsistence	3.801 €	EDIMBOURG, Ph. Garrec, 21-23/03/2017, ERF 2017 ; P. BETINELLI : Hanovre, 24-25/04/2017? Foire pour RIF ; PETEROLA, 06-07/06/2017, Tango Meetigin for RIF ; Grenoble, 15/11/2017; Meeting ERELEC
WP4	RTD	Travel and Subsistence	3.273 €	C. LEROUX : PALMA, 27-28/11/2017, E++ LAUNC CALL ; EDIMBOURG, 21-25/03/2017,ERF 2017 ; PONTEDERA, 2-5/08/2017, RIF MAILING ; BRISTOL, 1-2/10/2017, RIF MEETING
Subtotal Travel & Subsistence			**9.900 €**	
WP4	RTD	Consumables	43.062 €	Specific consumables for RIF projects
Subtotal Consumables			**43.062 €**	
WP4	RTD	Durable Equipment	**56.975 €**	Durable equipment for RIF operations
Subtotal Durable Equipment			**56.975 €**	
TOTAL DIRECT COSTS			**192.407 €**	
	MGT	Indirect Costs	1.954 €	
	RTD	Indirect Costs	37.488 €	
	OTHER	Indirect Costs	10.699 €	
TOTAL INDIRECT COSTS			**50.140 €**	
TOTAL COSTS			**242.547 €**	
TOTAL FUNDING REQUEST (FORM C)			**191.934 €**	

UPC

WP	Activity Type	Item description	Amount	Explanations
WP1	MGT	Personnel Costs	2.510 €	Cost of personnel devoted to WP1 activities for a total of 0,3 PM (Professor)
WP2	RTD	Personnel Costs	3.251 €	Cost of personnel devoted to WP2 activities for a total of 0,8 PM (Professor)
WP3	RTD	Personnel Costs	12.202 €	Cost of personnel devoted to WP3 activities for a total of 2,2 PM (Reseracher, Technician, Professor)
WP5	RTD	Personnel Costs	26.315 €	Cost of personnel devoted to WP5 activities for a total of 4,6 PM (Reseracher, Technician, Professor)
WP6	OTHER	Personnel Costs	56.956 €	Cost of personnel devoted to WP6 activities for a total of 10,7 PM (Reseracher, Technician, Professor)
Subtotal Personnel Costs			**101.235 €**	
WP1	MGT	Subcontracting	1.260 €	Audit CS1+CS2+CS3
WP1	MGT	Subcontracting	253 €	Coffee-break Echord++ Coordination Committee - Barcelona, 10th July 2017

WP5	RTD	Subcontracting	195 €	Catering 17/10 for Echord++ PDTI Urban robotics Final Evaluation Phase II. - Barcelona, 16-17th October 2017.
WP6	OTHER	Subcontracting	1.478 €	Installation stand Echord++ Global Robot Expo 2017: Stand and Presentation - Madrid, 2-4th February 2017
WP6	OTHER	Subcontracting	328 €	Transportation of different materials Echord++ Global Robot Expo 2017: Stand and Presentation - Madrid, 2-4th February 2017
WP6	OTHER	Subcontracting	500 €	Transportation of different materials Echord++ - Hannover, April 23rd - 25th, 2017
WP6	OTHER	Subcontracting	7.247 €	Stand SmartCity Expo World Congress - Barcelona, 14-16th November 2017
WP6	OTHER	Subcontracting	2.416 €	Stand SmartCity Expo World Congress - Barcelona, 14-16th November 2017
WP6	OTHER	Subcontracting	545 €	Transportation stand Innorobo - Paris, May 15th - 17th, 2017
WP6	OTHER	Subcontracting	245 €	Insurance robots Smart Regions with Smart Robots: Make it a Winning Formula for your Economy and Citizens - Brussels, May 10 2017
WP6	OTHER	Subcontracting	2.364 €	Transportation robots Smart Regions with Smart Robots: Make it a Winning Formula for your Economy and Citizens - Brussels, May 10 2017.
WP6	OTHER	Subcontracting	3.052 €	Assembly stand Hannover - Hannover, April 23rd - 25th, 2017
WP6	OTHER	Subcontracting	584 €	Miscelaneous materials Innorobo - Paris, May 15th - 17th 2017
WP6	OTHER	Subcontracting	3.406 €	Design stand SmartCity Expo World Congress - Barcelona, 14-16th November 2017
WP6	OTHER	Subcontracting	3.200 €	Video Smart City World Congress 2017 (PDTI instrument Echord++)
WP6	OTHER	Subcontracting	2.145 €	Video test images Phase II
WP6	OTHER	Subcontracting	340 €	Exhibition resgistration Hannover - Hannover, April 23rd - 25th, 2017
WP6	OTHER	Subcontracting	16.621 €	Stand Hannover - Hannover, April 23rd - 25th, 2017
WP6	OTHER	Subcontracting	625 €	Dissemination materials
WP6	OTHER	Subcontracting	200 €	Layout and graphic design Vinyls Echord++ Global Robot Expo 2017: Stand and Presentation - Madrid, 2-4th February 2017.
Subtotal Subcontracting			47.004€	
WP1	MGT	Travel and Subsist-ence	749 €	Echord++ Review Meeting Period 3 - Luxembourg, 13-14th February 2017 (Ana Maria Puig-Pey Claveria)
WP1	MGT	Travel and Subsist-ence	911 €	Echord++ Review Meeting Period 3 - Luxembourg, 13-14th February 2017 (Albert Sanfeliu Cortés)
WP1	MGT	Travel and Subsist-ence	699 €	Echord++ Review Meeting Period 3 - Luxembourg, 13-14th February 2017 (Antoni Grau Saldes)
WP1	MGT	Travel and Subsist-ence	176 €	Echord++ Preparation Meeting for Review Meeting Period 3 - Munich, 25-26th January 2017 (Ana Maria Puig-Pey Claveria)
WP1	MGT	Travel and Subsist-ence	287 €	Echord++ Communication and marketing after 3rd review - Munich, 20th June 2017 (Antoni Grau Saldes)

WP3	RTD	Travel and Subsistence	463 €	Echord++ Final Evaluation 2F Experiment - Pisa, 26th January 2017 (Antoni Grau Saldes)
WP3	RTD	Travel and Subsistence	168 €	Experiment technical evaluation - Eibar, 19/01/2017
WP5	RTD	Travel and Subsistence	110 €	Echord++ PDTI Sewer SIAR 2nd Monitoring session Phase II Test on site - Sevilla, 30th March 2017 (Antoni Grau Saldes)
WP5	RTD	Travel and Subsistence	179 €	Echord++ PDTI Sewer SIAR 2nd Monitoring session Phase II Test on site - Sevilla, 30th March 2017 (Ana Maria Puig-Pey Claveria)
WP5	RTD	Travel and Subsistence	32 €	Echord++ 2nd Monitoring Session Phase II Test on site - Cerdanyola, 15th March 2017 (Ana Maria Puig-Pey Claveria)
WP5	RTD	Travel and Subsistence	19 €	Echord++ 2nd Monitoring Session Phase II Test on site - Cerdanyola, 15th March 2017 (Antoni Grau Saldes)
WP5	RTD	Travel and Subsistence	19 €	Echord++ 2nd Monitoring Session Phase II Test on site - Cerdanyola, 15th March 2017 (Jose Casanovas Garcia)
WP6	OTHER	Travel and Subsistence	427 €	Echord++ Global Robot Expo 2017: Stand and Presentation - Madrid, 2-4th February 2017 (Ana Maria Puig-Pey Claveria)
WP6	OTHER	Travel and Subsistence	576 €	Smart Regions with Smart Robots: Make it a Winning Formula for your Economy and Citizens - Brussels, May 10 2017 (Fernando Herrero Cotarelo)
WP6	OTHER	Travel and Subsistence	224 €	Smart Regions with Smart Robots: Make it a Winning Formula for your Economy and Citizens - Brussels, May 10 2017 (Alberto Sanfeliu Cortes)
WP6	OTHER	Travel and Subsistence	627 €	Innorobo 2017: Echord++ Stand and Presentation - Paris, 15-17th May 2017 (Ana Maria Puig-Pey Claveria)
WP6	OTHER	Travel and Subsistence	543 €	Messe 2017: Echord++ Stand - Hannover, 23-25th April 2017 (Ana Maria Puig-Pey Claveria)
WP6	OTHER	Travel and Subsistence	1.297 €	Oceans'17 MTS/IEEE Conference - Aberdeen, 19-22nd June 2017 (Antoni Grau Saldes)
WP6	OTHER	Travel and Subsistence	1.989 €	IROS 2017: The 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems - Vancouver, 24-28th September 2017 (Ana Maria Puig-Pey Claveria)
WP6	OTHER	Travel and Subsistence	512 €	24th International Scientific Conference on Economic and Social Development "Managerial Issues in Modern Business" - Warsaw, 13-14th October 2017 (Antoni Grau Saldes)
WP6	OTHER	Travel and Subsistence	194 €	Echord++ European Robotics Week - Brussels, 20-23th November 2017 (Ana Maria Puig-Pey Claveria)
WP6	OTHER	Travel and Subsistence	63 €	SmartCity Expo World Congress - Barcelona, 14-16th November 2017 (Victor Vilchez Garcia)
Subtotal Travel & Subsistence			**10.262 €**	
WP5	RTD	Other Costs	86 €	Luch event Preparation of the 3rd Monitoring Period, Cerdanyola, 15th March 2017
WP5	RTD	Other Costs	32 €	Echord++ PDTI Sewer. Final Evaluation Phase II. - Barcelona, 16-17th October 2017 (lunch)
WP5	RTD	Other Costs	10 €	Echord++ PDTI Sewer. Final Evaluation Phase II. - Barcelona, 16-17th October 2017 (breakfast)
WP5	RTD	Other Costs	218 €	Echord++ PDTI Sewer. Final Evaluation Phase II. - Barcelona, 16-17th October 2017 (dinner)

WP5	RTD	Other Costs	16 €	Monitoring Meeting - Cerdanyola, 15th March 2017 (transportation)
WP6	OTHER	Other Costs	13 €	SmartCity Expo World Congress - Barcelona, 14-16th November 2017 (lunch)
WP6	OTHER	Other Costs	12 €	SmartCity Expo World Congress - Barcelona, 14-16th November 2017 (taxi)
WP6	OTHER	Other Costs	15 €	SmartCity Expo World Congress - Barcelona, 14-16th November 2017 (taxi)
WP6	OTHER	Other Costs	13 €	SmartCity Expo World Congress - Barcelona, 14-16th November 2017 (taxi)
WP6	OTHER	Other Costs	1.968 €	Different materials stand Innorobo - Paris, May 15th - 17th, 2017
WP6	OTHER	Other Costs	585 €	Publication article: "Robotics and Autonomous Systems: Public entities driven robotic innovation in urban areas"
Subtotal Other Direct Costs			**2.968 €**	
WP6	OTHER	Consumables	1.288 €	Miscelaneous of different stand materials
WP6	OTHER	Consumables	2.105 €	Vinyls Echord++ Global Robot Expo 2017: Stand and Presentation - Madrid, 2-4th February 2017
WP6	OTHER	Consumables	895 €	Vinyls Messe 2017: Echord++ Stand - Hannover, 23-25th April 2017.
WP6	OTHER	Consumables	2.394 €	Ballot boxes
WP6	OTHER	Consumables	1.060 €	Vinyls Innorobo 2017: Echord++ Stand and Presentation - Paris, 15-17th May 2017
WP6	OTHER	Consumables	1.770 €	Dissemination materials SmartCity Expo World Congress - Barcelona, 14-16th November 2017
Subtotal Consumables			**9.512 €**	
TOTAL DIRECT COSTS			**170.980 €**	
	MGT	Indirect Costs	2.459 €	
	RTD	Indirect Costs	40.916 €	
	OTHER	Indirect Costs	55.793 €	
TOTAL INDIRECT COSTS			**99.168 €**	
TOTAL COSTS			**270.149 €**	
TOTAL FUNDING REQUEST (FORM C)			**249.062 €**	

SSSA

WP	Activity Type	Item description	Amount	Explanations

WP1	MGT	Personnel Costs	12.642 €	Cost of personnel devoted to WP1 activities for a total of 3,16 PMs no. 1 Professor: P. Dario for a total of 0.20 PM; no. 1 technologist: F. Cecchi for 0.23 PM no. 1 Assistant Professor: S. Mazzoleni for 2.54 PMs no. 1 administrative pers.: B. Granvillano for 0.19 PM
WP3	RTD	Personnel Costs	49.586 €	Cost of personnel devoted to WP 3 activities for a total of 29.03 PMs: no. 1 Professor: P. Dario for 0.09 PM no. 1 Assistant Professor: S. Mazzoleni for 0,39 PM no. 6 Research Assistants: M.Bonaccorsi for 2 PMs; F. Bonsignorio for 6.93 PMs; C. Cruceli for 6.11 PMs; R. Esposito for 0.89 PM; G. Pastucci for 2,79 PMs; I. Strazzulla for 9.83 PMs
WP4	RTD	Personnel Costs	88.165 €	Cost of personnel devoted to WP 4 activities for a total of 26.56 PMs: no. 4 Research Assistants: G. Acerbi for 4.39 PMs; F. Bonsignorio for 0.80 PM; A. Morachioli for 9.84 PMs; P. Salvini for 2.68 PMs; no. 2 research collaborators: I. Mannari for 5.64 PMs, L. Barsocchi for 3.21 PMs
WP6	OTHER	Personnel Costs	28.606 €	Cost of personnel devoted to WP6 activities for a total of 8.20 PMs: no. 1 Professor: P. Dario for 0.26 PM; no. 1 Assistant Professor: S. Mazzoleni for 2.23 PMs no. 1 Research Assistant: F. Bonsignorio for 3 PMs no. 1 Reasearch Collaborator: I. Mannari for 2.71 PMs
Subtotal Personnel Costs			**178.999 €**	
WP1	MGT	Sub-Contracting	3.500 €	Auditing and certifications of the costs incurred for the period 01/10/2013-30/11/2016 made by an external revisor (Dott. Luigi Andrea CARELLO)- Issue of a Certificate on the Financial Statements (CFS)
WP4	RTD	Sub-Contracting	200 €	Catering service on the occasion of ECHORD++ RIF meeting - 3 August 2017, Pontedera and Peccioli (no. 10 participants)

WP6	OTHER	Sub-Contracting	2.512 €	Realization and printing of poster to be presented in international conferences and events; Articles publication fees; External service to supporting the creation of pictures for the dissemination of the Echord++ project; Catering on the occasion of the ECHORD++ Workshop Press Tour - 12 September 2017, Pontedera and Peccioli (10 people)
Subtotal Sub-Contracting			**6.212 €**	
WP3	RTD	Other Direct Costs	11.600 €	Experts Fees (+ reimbursements if applicable): no. 11 indipendent experts for the final review of E++ experiments (from the 1st Call of E++ Project)
WP4	RTD	Equipment	42.413 €	Depreciation share of the RIF equipment (depreciation period M39-M50, total 12 months): NAO next gen humanoid robotic platform; KUKA youBot system; COMAU RLM DualArm; Force/torque sensors - axis load cells; Parallel Gripper to be included in the DUAL ARM; COMAU SMART ROBOT EQUIPPED WITH C5G OPEN CONTROLLER; HUSKY Robotic platform
WP1	MGT	Travel and Subsistence	816 €	Participation in Echord++ Coordination Committee, 10 July 2017, Barcelona (P. Dario)
WP3/4	RTD	Travel and Subsistence	6.869 €	Participation of SSSA team in project technical meetings and events: Preparation meeting for ECHORD++ Review Meeting Period 2, 25-26 January 2017, Munich (A. Morachioli); Echord++ Review Meeting Period 3, 13-14 February 2017, EU Commission, Luxembourg (P. Dario, A. Morachioli, S. Mazzoleni); Echord++ General Assembly, 22 March 2017 (P. Dario, S. Mazzoleni, F. Bonsignorio); Echord++ Technical Meeting, 20 June 2017, Munich (F. Cecchi); RIF Meeting, 2 October 2017, Bristol (L. Barsocchi)
WP6	OTHER	Travel and Subsistence	3.903 €	Participation of SSSA team in conference and events: participation in the EUCognition Meeting (08-09.12.2016, Vienna), with the display of the Poster "Manipulation of delicate objects. A soft touch". (F.Bonsignorio); Workshop on "Robotics for Agri-Food Echord++ Experience" (23/03/2017) at the European Robotics Forum 2017, Edimburgh (P. Dario, F. Bonsignorio, S. Mazzoleni); Workshop "Smart Regions with Smart Robots", Brussels, 10 May 2017, to present a success story from Tuscany Region (P. Dario)
Subtotal Other Direct Costs			**65.601**	

TOTAL DIRECT COSTS			**250.812 €**	
	MGT	Indirect Costs	8.075 €	
	RTD	Indirect Costs	119.180 €	
	OTHER	Indirect Costs	19.505 €	
TOTAL INDIRECT COSTS			**146.760 €**	
TOTAL COSTS			**397.572 €**	
TOTAL FUNDING REQUEST (FORM C)			**318.069 €**	

UWE

WP	Activity Type	Item description	Amount	Explanations
WP1	MGT	Personnel Costs	3.024 €	Cost of personnel costs devoted to WP1 activities for total of 0,30 PMs [Prof. C. Melhuish & Prof. A. Pipe]
WP2	RTD	Personnel Costs	1.826 €	Cost of personnel costs devoted to WP2 activities for total of 0,34 PMs [Prof. C. Melhuish, Prof. A. Pipe & S.Forbes]
WP3	RTD	Personnel Costs	1.244 €	Cost of personnel costs devoted to WP3 activities for total of 0,14 PMs [Prof. C. Melhuish, Prof. A. Pipe, & S.Forbes]
WP4	RTD	Personnel Costs	163.963 €	Cost of personnel costs devoted to WP4 activities for total of 34,56 PMs [Prof. C. Melhuish, Prof. A. Pipe, F. Dailami, M. Haley, E.Bernardi & S.Forbes]
WP5	RTD	Personnel Costs	1.683 €	Cost of personnel costs devoted to WP5 activities for total of 0,2 PMs [Prof. C. Melhuish, Prof. A. Pipe & S.Forbes]
WP6	OTHER	Personnel Costs	8.095 €	Cost of personnel costs devoted to WP6 activities for total of 1,01 PMs [Prof. C. Melhuish, Prof. A. Pipe & F. Dailami] - Participation & presentation delivery in outreach activities.
Subtotal Personnel Costs			**179.835 €**	
WP4	RTD	Travel and Subsistence	86 €	RAS Industry Talk in Milan [C.Melhuish]
WP4	RTD	Travel and Subsistence	809 €	Travel costs: RIF Client site visits [F.Dailami & M.Haley]
WP6	OTHER	Travel and Subsistence	498 €	Advanced Factories Conference in Barcelona [M.Haley]
WP6	OTHER	Travel and Subsistence	665 €	euRobotics Forum in Edinburgh 2017 [T.Pipe, F.Dailami & C.Melhuish]
WP6	OTHER	Travel and Subsistence	1.790 €	Uk & European events representation [F.Dailami, M.Haley & C.Melhuish]
WP6	OTHER	Travel and Subsistence	799 €	RIF continuation events with JLR & Tharsus [F.Dailami & T.Pipe]
WP6	OTHER	Travel and Subsistence	733 €	ROMAN 2017 in Lisbon [C.Melhuish]
WP1	MGT	Travel and Subsistence	1.934 €	E++ meetings in Munich & Pontedera [F.Dailami & M.Haley]
WP1	MGT	Travel and Subsistence	976 €	E++ review meeting in Luxembourg 2017 [C.Melhuish & F.Dailami]
WP1	MGT	Travel and Subsistence	534 €	E++ PI meeting in Barcelona 2017 [C.Melhuish]
WP1	MGT	Travel and Subsistence	5.274 €	ICRA 2017 in Singapore [C.Melhuish]
WP1	MGT	Travel and Subsistence	1.462 €	Smart Regions Smart Robot Meetings in Brussels [C.Melhuish & F.Dailami]
Subtotal Travel & Subsistence			**15.559 €**	
WP4	RTD	Consumables	5.937 €	Purchase of specific consumables for RIF client projects
WP4	RTD	Consumables	2.763 €	Purchase of computer equipment for RIF operations
Subtotal Consumables			**8.701 €**	
WP4	RTD	Durable Equipment	7.348 €	Purchase of durable equipment: Universal Robots Grippers
WP4	RTD	Durable Equipment	16.243 €	Purchase of durable equipment: Cell for KUKA KR-60
WP4	RTD	Durable Equipment	16.488 €	Purchase of durable equipment: PickIt vision system
WP4	RTD	Durable Equipment	1.701 €	Purchase of durable equipment: Open Bionics Brunel hand
WP4	RTD	Other Direct Costs	3.885 €	Associated costs with currency exchange rate difference
WP4	RTD	Other Direct Costs	1.873 €	Audit fees (Mazars LLP)
WP4	RTD	Other Direct Costs	574 €	Purchase of online IT support including TeamLab PM tool
WP4	RTD	Other Direct Costs	3.477 €	Event costs including catering & venue hire for events
WP4	RTD	Other Direct Costs	45.670 €	Cost of temporary staff devoted to WP4 activities [Interns & Casual Staff]
WP4	RTD	Other Direct Costs	1.839 €	Conference fees for RIF Team incl. euRobotics 2017 & ICRA 2017
Subtotal Other Costs			**99.098 €**	
TOTAL DIRECT COSTS			**303.193 €**	
	MGT	Indirect Costs	7.923 €	
	RTD	Indirect Costs	166.445 €	
	OTHER	Indirect Costs	7.548 €	
TOTAL INDIRECT COSTS			**181.916 €**	
TOTAL COSTS			**485.109 €**	
TOTAL FUNDING REQUEST (FORM C)			**374.145 €**	

BOR

WP	Activity Type	Item description	Amount	Explanations
WP5	RTD	Personnel Costs	34.716 €	Cost for personnel devoted to WP5 activities for a total of 5,4 PM: Claus Risager (Co-CEO) 1,40 PM; Thomas Rubæk (VP Product Development) 0,04 PM; Franziska Kirstein (HRI Expert, Project Management) 2,63 PM; Morten Kofod-Jensen (VP Finance) 0,04 PM; Umair Qureshi (Robotics Developer) 0,95 PM; Ana-Maria Macovetchi (Student Assistant) 0,07 PM; Majid Ali Khan (Robotics Developer) 0,11 PM; Monika Jan Nasiri (Administration) 0,16 PM.
Subtotal Personnel Costs			**34.716 €**	
WP5	RTD	Travel and Subsistence	4.725 €	
Subtotal Travel & Subsistence			**4.725 €**	
TOTAL DIRECT COSTS			**39.441 €**	
	MGT	Indirect Costs	- €	
	RTD	Indirect Costs	23.664 €	
	OTHER	Indirect Costs	- €	
TOTAL INDIRECT COSTS			**23.664 €**	
TOTAL FUNDING REQUEST (FORM C)			**47.329 €**	

RU Robots

WP	Activity Type	Item description	Amount	Explanations
WP4	RTD	Personnel Costs	14.692 €	Cost for personnel for a total of 1,7 PM (Geoff Pegman)
WP6	OTHER	Personnel Costs	12.058 €	Cost for personnel for a total of 1,4 PM (Geoff Pegman)
Subtotal Personnel Costs			**26.749 €**	
WP4	RTD	Travel and Subsistence	171 €	RIF meeting in Bristol
WP6	OTHER	Travel and Subsistence	1.025 €	Core Consortium and review meetings
Subtotal Travel & Subsistence			**1.196 €**	
TOTAL DIRECT COSTS			**27.946 €**	
	MGT	Indirect Costs	- €	
	RTD	Indirect Costs	8.918 €	
	OTHER	Indirect Costs	13.083 €	
TOTAL INDIRECT COSTS			**22.001 €**	
TOTAL FUNDING REQUEST (FORM C)			**37.460 €**	

TeD

WP	Activity Type	Item description	Amount	Explanations
WP4	RTD	Personnel Costs	21.550 €	Cost of personnel devoted to WP 4 to organize the panel tests in Peccioli for a total of 5 PM (1 PM for the Project Manager and 4 for an Engineer)
Subtotal Personnel Costs			**21.550 €**	
WP4	RTD	Subcontracting	2.700 €	Supporting activities during tests at Peccioli RIF
Subtotal Subcontracting			**2.700 €**	
TOTAL DIRECT COSTS			**24.250 €**	
	MGT	Indirect Costs	- €	
	RTD	Indirect Costs	12.930 €	
	OTHER	Indirect Costs	- €	
TOTAL INDIRECT COSTS			**12.930 €**	
TOTAL FUNDING REQUEST (FORM C)			**27.885 €**	

The overall amount of direct costs claimed by the core consortium during the period is in line with the corresponding runtime of the project (50 months out of 64, i.e. about 78%). The larger share of resources invested was dedicated to the activities reported in the RTD work packages, which were all operating during the period. A large share of resources was dedicated, in fact, to the modification of ongoing processes (e.g. PDTI) and their effective coordination. SSSA has proposed a shift of financial resources within their own budget, from other direct costs to personnel costs to increase the number of PM for the remaining periods. This change will be discussed during the review meeting and formally included in an upcoming amendment request.

Partner	Cost Categories	Budget (Amendment V)	Period 1	Period 2	Period 3	Period 4	Total Actual Costs	Budget used	Remaining Budget
TUM	Personnel costs	1.116.500 €	58.336 €	289.332 €	312.355 €	261.505 €	921.528 €	83%	194.972 €
	Subcontracting	250.000 €	76.532 €	49.086 €	54.512 €	18.511 €	198.641 €	79%	51.359 €
	Other direct costs	322.369 €	5.259 €	70.114 €	70.960 €	48.538 €	194.871 €	60%	127.498 €
	Adjustments	0 €	0 €	3.925 €	29.052 €	75 €	33.052 €		
	Total direct	1.688.869 €	140.127 €	412.457 €	466.879 €	328.628 €	1.348.091 €	80%	340.778 €
	Indirect Costs	863.321 €	38.156 €	215.664 €	229.988 €	186.025 €	669.833 €	78%	193.488 €
	Grand Total	2.552.190 €	178.283 €	628.121 €	696.867 €	514.654 €	2.017.925 €	79%	534.266 €
	EU-Funding Request	2.187.224 €	162.091 €	506.784 €	534.196 €	412.360 €	1.615.431 €	74%	571.793 €
SSSA	Personnel costs	606.800 €	48.202 €	108.427 €	430.156 €	178.999 €	765.784 €	126%	-158.984 €
	Subcontracting	40.000 €	2.991 €	16.321 €	4.469 €	6.212 €	29.993 €	75%	10.007 €
	Other direct costs	591.900 €	10.892 €	108.430 €	132.839 €	65.601 €	317.762 €	54%	274.138 €
	Adjustments	0 €	0 €	-526 €	-7.670 €	12.343 €	4.147 €		
	Total direct	1.238.700 €	62.085 €	232.652 €	559.794 €	263.155 €	1.117.686 €	90%	121.014 €
	Indirect Costs	719.220 €	35.455 €	130.113 €	337.795 €	146.760 €	650.123 €	90%	69.097 €
	Grand Total	1.957.920 €	97.540 €	363.291 €	905.259 €	397.572 €	1.763.662 €	90%	194.258 €
	EU-Funding Request	1.590.200 €	79.833 €	293.432 €	712.227 €	318.069 €	1.403.561 €	88%	186.639 €
UWE	Personnel costs	696.996 €	68.294 €	222.026 €		179.835 €	470.155 €	67%	226.841 €
	Subcontracting	10.000 €	0 €	0 €		0 €	0 €	0%	10.000 €
	Other direct costs	476.100 €	36.079 €	103.624 €		123.358 €	263.061 €	55%	213.039 €
	Adjustments	0 €	0 €	292 €		0 €	292 €		
	Total direct	1.183.096 €	104.373 €	325.650 €		303.193 €	733.216 €	62%	449.880 €
	Indirect Costs	703.858 €	62.623 €	195.389 €		181.916 €	439.928 €	63%	263.930 €
	Grand Total	1.886.954 €	166.996 €	521.039 €		485.109 €	1.173.144 €	62%	713.810 €
	EU-Funding Request	1.444.415 €	128.855 €	403.569 €		374.145 €	906.569 €	63%	537.846 €
UPC	Personnel costs	296.461 €	48.683 €	76.021 €	79.355 €	101.235 €	305.294 €	103%	-8.833 €
	Subcontracting	355.000 €	2.710 €	4.831 €	57.781 €	47.004 €	112.326 €	32%	242.674 €
	Other direct costs	73.700 €	5.782 €	22.214 €	20.893 €	22.742 €	71.631 €	97%	2.069 €
	Adjustments	0 €	0 €	-699 €	-3.167 €	39.863 €	35.997 €		
	Total direct	725.161 €	57.175 €	102.367 €	154.862 €	210.843 €	525.247 €	72%	199.914 €
	Indirect Costs	287.180 €	44.779 €	71.435 €	69.493 €	99.168 €	284.875 €	99%	2.305 €
	Grand Total	1.012.341 €	101.954 €	174.501 €	227.522 €	270.149 €	774.126 €	76%	238.215 €
	EU-Funding Request	944.668 €	89.775 €	150.878 €	212.232 €	249.062 €	701.947 €	74%	242.720 €
CEA	Personnel costs	442.508 €	13.656 €	101.063 €	162.627 €	82.471 €	359.817 €	81%	82.691 €
	Subcontracting	7.500 €	0 €	0 €	0 €	0 €	0 €	0%	7.500 €
	Other direct costs	476.100 €	1.741 €	135.756 €	163.209 €	109.936 €	410.642 €	86%	65.458 €
	Adjustments	0 €	0 €	0 €	5.592 €	0 €	5.592 €		-5.592 €
	Total direct	926.108 €	15.397 €	236.819 €	331.428 €	192.407 €	776.051 €	84%	150.056 €
	Indirect Costs	246.830 €	8.018 €	59.143 €	96.847 €	50.140 €	214.148 €	87%	32.682 €
	Grand Total	1.172.938 €	23.415 €	295.962 €	428.275 €	242.547 €	990.199 €	84%	182.739 €
	Funding Request	904.200 €	20.669 €	234.507 €	322.007 €	191.934 €	769.117 €	85%	135.083 €

Partner	Cost Categories	Budget (Amendment V)	Period 1	Period 2	Period 3	Period 4	Total Actual Costs	Budget used	Remaining Budget
BOR	Personnel costs	135.900 €	18.000 €	48.000 €	32.308 €	34.716 €	133.024 €	98%	2.876 €
	Subcontracting	0 €	0 €	0 €	0 €	0 €	0 €		0 €
	Other direct costs	22.850 €	2.299 €	6.383 €	8.219 €	4.725 €	21.626 €	95%	1.224 €
	Adjustments	0 €	0 €	0 €	-14.913 €	0 €	-14.913 €		
	Total direct	158.750 €	20.299 €	54.383 €	25.614 €	39.441 €	139.737 €	88%	19.013 €
	Indirect Costs	95.250 €	12.179 €	32.629 €	24.316 €	23.664 €	92.788 €	97%	2.462 €
	Grand Total	254.000 €	32.478 €	87.012 €	49.930 €	63.105 €	232.525 €	92%	21.475 €
	Funding Request	192.900 €	24.358 €	65.259 €	48.632 €	47.329 €	185.578 €	96%	7.322 €
RU Robots	Personnel costs	108.503 €	2.108 €	28.400 €	27.250 €	26.749 €	84.507 €	78%	23.995 €
	Subcontracting	0 €	0 €	0 €	0 €	0 €	0 €		0 €
	Other direct costs	30.250 €	0 €	5.238 €	2.088 €	1.196 €	8.522 €	28%	21.728 €
	Adjustments	0 €	0 €	0 €	0 €	0 €	0 €		
	Total direct	138.753 €	2.108 €	33.638 €	29.338 €	27.946 €	93.030 €	67%	45.723 €
	Indirect Costs	83.252 €	1.264 €	20.182 €	17.602 €	22.001 €	61.049 €	73%	22.203 €
	Grand Total	222.004 €	3.372 €	53.820 €	46.940 €	49.947 €	154.079 €	69%	67.925 €
	Fuding Request	178.337 €	2.529 €	40.365 €	35.205 €	37.460 €	115.559 €	65%	62.778 €
TECHNODEAL	Personnel costs	71.000 €	0 €	0 €	42.660 €	21.550 €	64.210 €	90%	6.790 €
	Subcontracting	8.400 €	0 €	0 €	1.300 €	2.700 €	4.000 €	48%	4.400 €
	Other direct costs	5.000 €	0 €	0 €	0 €	0 €	0 €	0%	5.000 €
	Adjustments	0 €	0 €	0 €	0 €	0 €	0 €		
	Total direct	84.400 €	0 €	0 €	43.960 €	24.250 €	68.210 €	81%	16.190 €
	Indirect Costs	45.600 €	0 €	0 €	25.596 €	12.930 €	38.526 €	84%	7.074 €
	Grand Total	130.000 €	0 €	0 €	69.556 €	37.180 €	106.736 €	82%	23.264 €
	Fuding Request	97.500 €	0 €	0 €	52.167 €	27.885 €	80.052 €	82%	17.448 €
TOTAL	**Personnel costs**	3.474.667 €	257.279 €	873.269 €	1.086.711 €	887.059 €	3.104.318 €	89%	370.349 €
	Subcontracting	670.900 €	82.233 €	70.238 €	118.062 €	74.426 €	344.959 €	51%	325.941 €
	Other direct costs	1.998.269 €	62.052 €	451.759 €	398.208 €	376.096 €	1.288.115 €	64%	710.154 €
	Adjustments	0 €	0 €	2.992 €	8.894 €	52.281 €	64.167 €		
	Total direct	**6.143.836 €**	**401.564 €**	**1.397.966 €**	**1.611.875 €**	**1.389.863 €**	**4.801.268 €**	78%	**1.342.568 €**
	Indirect Costs	3.044.511 €	202.474 €	724.555 €	801.637 €	722.604 €	2.451.270 €	81%	593.240 €
	Grand Total	**9.188.347 €**	**604.038 €**	**2.123.746 €**	**2.424.349 €**	**2.060.262 €**	**7.212.395 €**	78%	**1.975.952 €**
	EU-Funding Request	**7.539.443 €**	**508.110 €**	**1.694.794 €**	**1.916.666 €**	**1.658.244 €**	**5.777.814 €**	77%	**1.761.629 €**

4.2 Personnel effort – Core Consortium

	TUM	SSSA	UWE	UPC	CEA	BOR	RU	TED	TOTAL
WP1	6,43	3,16	0,30	0,30	0,35	0,00	0,00	0,00	10,5
WP2	17,09	0,00	0,34	0,80	1,27	0,00	0,00	0,00	19,5
WP3	10,98	29,03	0,14	2,20	0,35	0,00	0,00	0,00	42,7
WP4	1,65	26,56	34,56	0,00	9,96	0,00	1,70	5,00	79,4
WP5	1,33	0,00	0,20	4,60	0,00	5,40	0,00	0,00	11,5
WP6	0,84	8,20	1,01	10,70	1,89	0,00	1,40	0,00	24,0
TOTAL	**38,32**	**66,95**	**36,55**	**18,60**	**13,82**	**5,40**	**3,10**	**5,00**	**187,74**

The personnel effort devoted to this period's activities is higher than the one proposed in the budget. This is mainly due to the involvement of some of the core consortium partners in activities that go beyond those initially specified in their budgets. In particular, for SSSA the implemented hiring strategy was different to the one budgeted. The cost for personnel has been lower than the one estimated in the DoW (in particular because many research assistants have been involved), but much more time-consuming than foreseen. For these reasons, SSSA proposed a budget shift from other direct costs to personnel costs to increase the number of PM for the remaining period. This change will be requested in RP 5.

Partner	Work Packages	Budget (Amendment V)	Period 1	Period 2	Period 3	Period 4	Total Actual PM	PM used
TUM	WP1	51,00	2,70	4,47	4,14	6,43	17,74	35%
	WP2	80,50	6,60	24,25	28,64	17,09	76,58	95%
	WP3	27,00	1,00	9,91	8,08	10,98	29,97	111%
	WP4	4,00	0,70	0,68	2,67	1,65	5,70	143%
	WP5	28,00	0,20	9,61	3,93	1,33	15,07	54%
	WP6	12,50	0,50	2,56	1,87	0,84	5,77	46%
SSSA	WP1	1,00	2,51	0,77	3,16	3,16	9,60	960%
	WP2	2,50	1,64	0,36	1,01	0,00	3,01	120%
	WP3	45,00	9,17	9,99	53,80	29,03	101,99	227%
	WP4	109,00	2,35	26,24	95,92	26,56	151,07	139%
	WP5	1,00	0,00	0,00	5,22	0,00	5,22	522%
	WP6	5,50	1,31	7,79	18,10	8,20	35,40	644%
UWE	WP1	1,00	0,14	0,37	0,44	0,30	1,25	125%
	WP2	2,50	0,23	0,83	1,04	0,34	2,44	98%
	WP3	0,50	0,06	0,17	0,27	0,14	0,64	128%
	WP4	121,50	11,96	34,65	38,89	34,56	120,06	99%
	WP5	1,00	0,12	0,35	0,41	0,20	1,08	108%
	WP6	5,50	0,41	1,87	2,04	1,01	5,33	97%
UPC	WP1	1,00	0,09	0,21	0,30	0,30	0,90	90%
	WP2	2,50	0,25	0,70	0,50	0,80	2,25	90%
	WP3	10,50	0,09	4,10	3,50	2,20	9,89	94%
	WP4							
	WP5	11,00	2,92	3,15	2,00	4,60	12,67	115%
	WP6	32,00	2,87	6,20	8,70	10,70	28,47	89%
CEA	WP1	1,00	0,11	0,58	0,48	0,35	1,52	152%
	WP2	2,50	0,12	0,56	0,51	1,27	2,46	98%
	WP3	0,00				0,35	0,35	
	WP4	64,50	0,57	11,98	23,65	9,96	46,16	72%
	WP5	1,00	0,12	1,45	1,38	0,00	2,95	295%
	WP6	5,50	0,87	3,32	2,77	1,89	8,85	161%
BOR	WP1	0,00					0,00	
	WP2	1,50	0,00	0,00	0,00	0,00	0,00	0%
	WP3	0,00					0,00	
	WP4	0,00					0,00	
	WP5	21,80	3,00	8,00	7,00	5,40	23,40	107%
	WP6	0,00					0,00	

Partner	Work Packages	Budget (Amendment V)	Period 1	Period 2	Period 3	Period 4	Total Actual PM	PM used
RUR	WP1	0,00					0,00	
	WP2	1,50	0,00	0,97	0,00	0,00	0,97	65%
	WP3	0,00					0,00	
	WP4	3,50	0,23	0,97	2,70	1,70	5,60	160%
	WP5	4,00	0,00	0,97	0,00	0,00	0,97	24%
	WP6	2,50	0,00	0,00	0,00	1,40	1,40	56%
TeD	WP1	0,00					0,00	
	WP2	0,00					0,00	
	WP3	0,00					0,00	
	WP4	20,00	0,00	0,00	12,00	5,00	17,00	85%
	WP5	0,00					0,00	
	WP6	0,00					0,00	
TOTAL	**All WP**	**685,3**	**52,8**	**178,0**	**335,1**	**187,7**	**753,7**	**110%**

4.3 Certificates of financial statements

Only TUM, the project's coordinator, has exceeded the funding request limit of 375.000 € for the fourth reporting period and will, therefore, need a certificate for its financial statement (audit certificate). The audit process is currently ongoing.

4.4 Financial statements – Other beneficiaries

The financial statements of the other beneficiaries will be submitted through the NEF portal as soon as amendment sessions VI (currently ongoing) and VII (planned) will be closed.