SPARC Public Private Partnership

Periodic Monitoring Report 2017

SPARC
The Partnership for Robotics in Europe

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SPARC Periodic Monitoring Report 2017

FOREWORD

The development of Robotics and AI is now proceeding faster than ever and is entering new markets that transform working environments and daily lives.

The SPARC partnership has made a contribution to the Digitisation of European Industry strategy, which it is important to continue. Its key components – hubs, platforms and pilots, standardisation, regulatory framework and skills in the era of digitalisation – can already be found seeded within the current European robotics community. A great step towards further integration of the wider European Robotics community into the DEI landscape focuses on the need for a 'Physical AI' that brings the AI to the physical world. One step in this direction was the preparatory phase for establishing pan-European networks of Digital Innovation Hubs in Healthcare, Inspection and Maintenance of Infrastructure, Agri-Food, and Agile Production. We look forward to a continuation of the fruitful cooperation within SPARC and to shape a partnership in FP9.

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1. INTRODUCTION: THE SPARC CPPP

This year is significant as it marks the mid-point in the SPARC cPPP partnership under Horizon 2020. It is therefore important to reflect on our success and further enhance this valued relationship during the second half of Horizon 2020. Most importantly this collaboration between the European Commission and euRobotics aisbl has delivered a deeper mutual understanding, it has enabled well focused work programmes to address common goals and challenges, so far, it has seen some 71 actions funded and a total of €323M invested in European Robotics. Above all it has increased the engagement of industry and SMEs in collaborative actions with academia and stimulated greater technology transfer.

The early part of 2017 saw the delivery of the final stages of the private side input to the 2018-2020 work programme focused on delivering the DEI strategy within robotics through a collection of DIH networks covering key robotics domains and associated pilots and platforms. This year has also seen the re-emergence of AI as a strategic vehicle. Robotics and AI have always had a very close and integrated

relationship and this new understanding by policy makers will build on the strengths we have developed during the last two decades. The delivery of Physical Intelligence in robots is critical to every future application of robotics across the sectors. SPARC is fully engaged in the further implementation of Physical Intelligence as a cornerstone of technology and application development. The expected development of DIH networks in 2019 will strongly support this and the 2018-2020 work programme focuses on cognitive technology development in robotics addressing AI integration and the development of smart robotics.

Looking to the future and to the next framework programme, the robotics community through SPARC is committed to building closer relationships with our neighbouring cPPPs and in developing mission-oriented approaches that can deliver value to the market while addressing key societal challenges. Robotics has much to contribute and the successful growth of European Robotics SMEs and their interaction with End Users is critical to developing new products and services in agri-food, healthcare, manufacturing and the maintenance of infrastructure.

1.1. ABOUT SPARC

SPARC is a contractual Public-Private Partnership (cPPP) on robotics between the European Commission, and the European Robotics Association euRobotics aisbl was established under Horizon 2020. It delivers against the strategic goals for European robotics as set out in the Contractual Arrangement (CA) and the Strategic Research Agenda (SRA).

The goal of SPARC is to integrate academic and industrial members and to create partnerships between innovation providers, such as SMEs and end users that own the problem space where robotics can have an impact. This demands the acceptance of a broad range of different types of stakeholder within the association, reflecting both the breadth of robotics applications and the depth of value chains and networks. This diversity is also reflected in the composition of the Board of Directors (See Appendix A) where there is representation from all types and sizes of organisation. In addition SPARC engages with stakeholders outside of the association membership: technical specialists such as surgeons, lawyers, and regulators but also with the civil society at large. This external engagement is enacted through the association's Topic Groups, and through direct contact with other organisations or during dedicated events.

1.2. GOALS AND OBJECTIVES

SPARC published the latest version of its Strategic Research Agenda (SRA) at its launch in June 2014, which is supported by the more detailed Multi-Annual Roadmap (MAR), which was last updated beginning of 2017. This sets out the goals and objectives of the partnership which are reflected in the Contractual Agreement (CA). The goals of SPARC are to

1. Strengthen the European robotics supply industry across all markets.

2. Reinforce Europe's industrial competitiveness through innovative robotic technologies
3. Position robotic products and services as key enablers for solving Europe's societal challenges
4. Strengthen networking activities of the European robotics community
5. Promote European robotics
6. Reach out to existing and new users and markets
7. Contribute to policy development and addressing Ethical, Legal, and Societal issues

The scope of the SPARC cPPP is broad-based, encompassing all sectors where robotics technology is expected to have an impact. It specifically focuses on maintaining and reinforcing Europe's position as a supplier of both industrial and service robotics and identifies the sectors where Europe has a competitive edge and prioritises opportunities. A primary objective is to decrease innovation time to market and promote the cross fertilisation of technology and best practice. In 2017, four Priority Areas have been identified:

- Healthcare
- Agri-Food
- Inspection and Maintenance of Infrastructure
- Agile Production

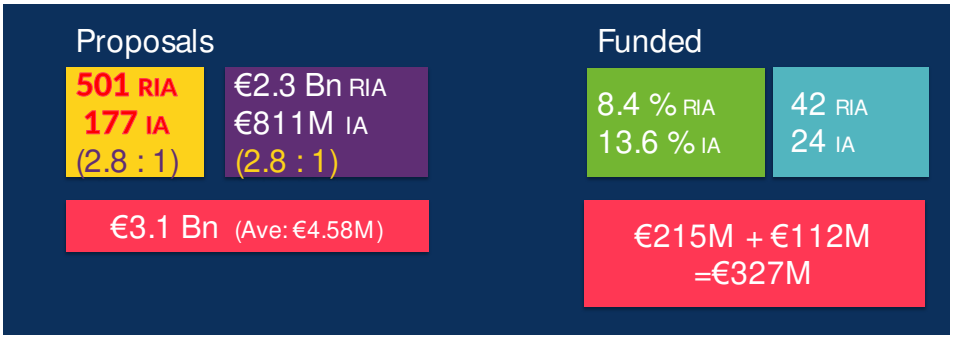
This does not exclude other application domains, especially within market sectors with key European end-users, for example in energy, mining, logistics, and their related service industries. Within the structure of the euRobotics, diverse interests are represented through Topic Groups covering different technology areas, markets and cross sector activities.

SPARC is governed through a Partnership Board that is composed of EC representatives and the Board of Directors of euRobotics, which is composed equally of representatives from academia (including research technology organisations) and industry (including large industry, SMEs, and end user organisations). The Commission acts within the partnership to coordinate the work programme development and its implementation, while euRobotics acts to engage with the stakeholders and technical specialists to develop the private side input to the work programme. Both sides engage with the broader stakeholder community. The executive functions of euRobotics are organised through the secretariat, located in Brussels, and managed by the Secretary General on a day to day basis. The Board of Directors coordinates strategy and provides oversight and direction to the private side and the General Assembly provides approval and member engagement in the strategic decision making.

2. MAIN ACTIVITIES AND ACHIEVEMENTS DURING 2017

2.1. IMPLEMENTATION OF THE CALLS FOR PROPOSALS EVALUATED IN 2017

The 2017 work programme builds on a selection of key themes within the Multi-Annual Roadmap and is divided into three parts. The first, ICT-25, funded at €34M delivers a more open call covering technology challenges and use case driven application development. The second part, ICT-27, funded at €48M addresses more focused actions and the final part covers two CSAs one covering competitions and the other community support together funded at €5M.



Instrument	Target	Topic	Proposals	Funded	Success
RIA	ICT-25a-2017	Open topics	26	2	7.69%
	ICT-25b-2017	Technical Step Change	58	2	3.45%
	ICT-27a-2017	Specific System Abilites	27	2	7.41%
	ICT-27b-2017	SME Research Or Benchmarking (FSTP)	7	3	42.86%
			118	**9**	**7.6%**
IA	ICT-25c-2017	User Driven App Dev	38	3	7.89%
	ICT-25d-2017	Tech & Reg Gap Filling	5	3	60.00%
	ICT-27c-2017	Safety Certification (FSTP)	6	1	16.67%
			49	**7**	**14.3%**

The above figure and table show the overall number of applications to the call and the final outcome and success rates. As has been the case in all calls to date there is significant oversubscription in the open parts of the call with the consequence that some excellent proposals fall short of being funded. The well focused components of the call provide a higher success rate and are by definition more directed at specific needs. In particular (ICT-27-2017 a) concentrates on critical system abilities important for dependability. It was observed from the set of proposals submitted to the 2014/15 work programme that the system ability of "Dependability" was significantly under represented. This motivated the focus on system attributes related to dependability within the 2017 work programme because dependability is critical to successful deployment in real world applications.

In the second focused target (ICT-27-2017 b1) addresses the delivery of a cascade funding scheme to stimulate small projects within SMEs that will allow them to

address new markets. This is aimed at stimulating SMEs to expand their market and grow beyond a first product. From analysis of the 2014/15 work programme proposals and funded actions it was clear that RIAs and IAs do not attract enough SMEs whereas smaller actions with a lower overhead, such as those offered through the ECHORD project, do. This is highlighted by SMEs having a much lower success rate in the 2014/15 work programme than any other organisation category, just 4% for 2014 and 5% for 2015. The actions System4Robots and ESMERA will now address this focus.

The third focus element (ICT-27-2017 b2) addresses the specific issue of establishing performance benchmarks and, in particular, developing benchmark processes that can assist an End User in assessing performance. This issue is critical in setting a baseline of performance that can be used to assess innovation and developmental progress. The action EUROBENCH will addresses this focus.

The final focus element (ICT-27-2017 c) concerns the increased physical collaboration between robots and people. Collaborative working is likely to increase significantly in the next decade however there is a lack of standardisation around the assessment of collaborative safety particularly when interacting with vulnerable individuals or unskilled workers. This topic provides the potential to utilise cascade funding through FSTP to fund specific developments that can establish tools and procedures to assess and validate collaborative working. The project COVR now addresses this area.

In addition to the above the 2017 work programme covered a joint activity with DG-AGRI (SFS-2017-1) on precision agriculture from which two projects were funded, PANTHEON and ROMI. In addition (ICT-27-2017 d) called for a PcP action on smart cities. Previous PcP actions have failed to attract proposals however this call has resulted in the action FABULOS being funded.

Finally the CSA target has funded two projects one against each objective: INBOTS on community action and SCIROC on competitions addressing smart cities.

2.2. MOBILISATION OF STAKEHOLDERS, OUTREACH, SUCCESS STORIES

Mobilization of stakeholders and events

Several dedicated events to mobilize stakeholders and for outreach were organised by euRobotics and SPARC over the year 2017.

ERF2017: Under the theme "Living and working with robots", the 8th European Robotics Forum (ERF2017) took place on 22-24 March 2017 in Edinburgh, Scotland, UK. 840 attendees from all over Europe and beyond participated in the over 60 workshops, along with 31 exhibitors and sponsors. The event benefited from wide media coverage in Scottish and international outlets, amongst which BBC and The

Times. It also generated some 1 million impressions on social media, with a focus on Twitter.

Smart Regions with Smart Robots: On May 10, 2017, about 200 robotics experts and local, regional, and national authorities discussed how to develop regional innovation strategies based on robotics at the Committee of Regions in Brussels. Under the hashtag #smartregions, this very first event looking into the potential that robotics has for Europe's regions, benefitted from over 700,000 impressions on Twitter and several articles on EU institutions, hubs, and company websites.

RockEU2 Outreach Advisory Board (29 June 2017) and National Coordinator meeting (30 June 2017) for the ERW – the two meetings brought together two groups of some 20 attendees each representing the community. The groups discussed topics such as communication, education, sponsoring, competitions outreach of robotics. Each meeting was reported on in the SPARC newsletter. The National Coordinators meeting represented the starting point of the European Robotics Week 2018 which saw the organisation of almost 1000 events in 35 countries.

Workshop Series on Priority Areas and the Workshop on AI and Robotics. The Workshop Series on Priority Areas kicked off with an event in Brussels on 10 October 2017 which attracted more than 30 Artificial Intelligence leaders from 11 European countries. Many participants then went on to join the European AI On-Demand Platform Brokerage day hosted by the European Commission on 5 December 2017. The AI Workshop was followed by workshops on Maintenance and Inspection for Infrastructure, Agri-Food, Healthcare Robotics, and Agile Production between Nov 2017 and Jan 2018, all taking place in Brussels. The goal being to shape concepts for networks of Digital Innovation Hubs and Platforms and to prepare for the Robotics Information and Brokerage Day (see below). This approach to pre-brokerage meetings was taken because of the exclusive focus on DIH network building in the 2018 Robotics ICT work programme and the need to alert and align the wider community in forming appropriately focused consortia. DIH networks will be a key component in the delivery of DEI objectives by SPARC over the next five years.

The **European Robotics Week 2017** (ERW) with its central event titled "Robots Discovery" was hosted by the European Committee of the Regions on 20-23 November 2017. Robotics experts from 30 European and regionally-funded projects outlined the impact of their work on society in areas such as healthcare, education, environment and international cooperation and showed the results to

the Committee members and other visitors. Side events such as Sohjoa robot bus demo at the European Parliament Esplanade, a robotics orchestra concert and robotics classes for children took place in Belgium, along with around 1000 events in some 35 countries in Europe and beyond. In total, the events enjoyed over 100 mentions in important outlets such as: Il sole 24 ore (Italy), and DW Wissenschaft (Germany), RTVE (Spain). The #ERW2017 hashtag has reached over 1 million impressions on social media.

The **Robotics Information and Brokerage event** organised by SPARC on 5 Dec 2017 brought together 200 roboticists from the priority areas (healthcare, agri-food, inspection and maintenance and agile production) to explore the new 2018-2020 Work Programme and particularly the call for Robotics Digital Innovation Hubs (DIH) with the goal to inform the community and possibly seed consortia building for inclusive, community-driven H2020 proposals.

Success stories

Projects funded under the umbrella of SPARC are now developing and first concrete results start to be available. Achievements have social and economic impacts, with prototypes developed and tested in real-world environment. All projects share the goal to support humans in their daily life private or professional making their activities safer, easier to perform or more efficient through the use of intelligent robots ("Physical AI"). Innovation and technology transfer are a key component of all projects. Some examples are given here:

AEROARMS develops advanced aerial contact drones. The semi-autonomous drone can lift instruments and press them against structures making risky industrial inspections safer and more cost-effective. It should be of great use in the oil and gas sector for example. Market expectations of such a system are EUR 300 million/year just in Europe. AEROARMS was the winner of the 2017 all categories Innovation Radar prize, demonstrating its excellence in both research and innovation, and its commitment to the exploitation of results.

Two other robotics projects made it to the 20 finalists list of the Innovation Radar Prize in 2017: Bots2Rec (Mobile Robotic Units for the Removal of Asbestos Contamination) and RoMAns (Slave arm for the teleoperation in the nuclear industry), both combining strong research results with involvement of end-users and full validation of the developed systems.

The EndoVESPA project aims at developing an integrated robotic platform for the navigation of a soft-tethered colonoscope capable of performing painless diagnosis and treatment. Colorectal cancer is one of the major causes of mortality (fourth of the cancers for incidence), but survival rate dramatically increases in case of early diagnosis. Results obtained so far are promising. The first porotypes are currently tested, with excellent prospects for exploitation on the medical market. Another EU-funded project, MURAB, also deals with cancer improved diagnosis

and aims at drastically improve precision and effectiveness of biopsies, in particular breast cancers.

SPEXOR develops a novel and effective spinal exoskeleton that will prevent low-back pain in able-bodied workers and support workers with low-back pain who are reintegrating in the vocational setting. The proposed ergonomic exoskeleton is the first of its kind able to support the spine during work activities and is suitable for several work situations and professions.

The SMOKEBOT projects develops civil robots supporting fire brigades in search and rescue missions, e.g. in post-disaster management operations in restricted visibility environment such as tunnel fires. Significant progress over state-of-art has been achieved in sensor technology and AI/cognitive approaches to cope with such demanding conditions, coupled with a robotic application.

COMANOID investigates the deployment of humanoid robotic solutions in Airbus airliner assembly operations. It targets tasks that are laborious or tedious for human workers and for which access is impossible for wheeled or rail-ported robotic platforms. This project illustrates well the need for multi-disciplinary consortium, with academics, industries and end-users defining together specifications, providing needed improvements to current existing solutions and allowing extensive testing of the prototype.

2.3. GOVERNANCE

SPARC is governed through a Partnership Board that is composed of EC representatives and the Board of Directors of euRobotics aisbl, representing the private side of the PPP.

euRobotics aisbl is a non-profit organisation based in Brussels that acts to engage with the stakeholders and technical specialists to develop the private side input to the work programme and engage with the broader stakeholder community. The executive functions of euRobotics are organised through the secretariat, located in Brussels, and managed by the Secretary General on a day to day basis. The Board of Directors coordinates strategy and provides oversight and direction to the private side and the General Assembly provides approval and member engagement in the strategic decision making.

The euRobotics Board of Directors is composed equally of representatives from academia, including research technology organisations, and industry including large industry, SMEs, and end user organisations. The composition of the Board follows a 3-year election cycle where every year at the association's General Assembly a third of the Board members is re-elected. Each member of euRobotics may vote for the number of candidates within their own category of membership

(Research/Industrial). The Board of Directors then elects every three years a President. Also, each year one of two Vice-Presidents (Industry and Academia), or the Treasurer are elected with a service period of three years. An Executive Team with the Vice Presidents, the Treasurer, and three additional members from the Board of Directors ensures a proper high-level capacity in decision making and representation of the association.

The association charges annual membership fees that are related to the level of robotics activity within an organisation. An especially low fee is available for micro organisations and start-ups to encourage a broad franchise. The association also collaborates within Coordination and Support actions in the robotics area.

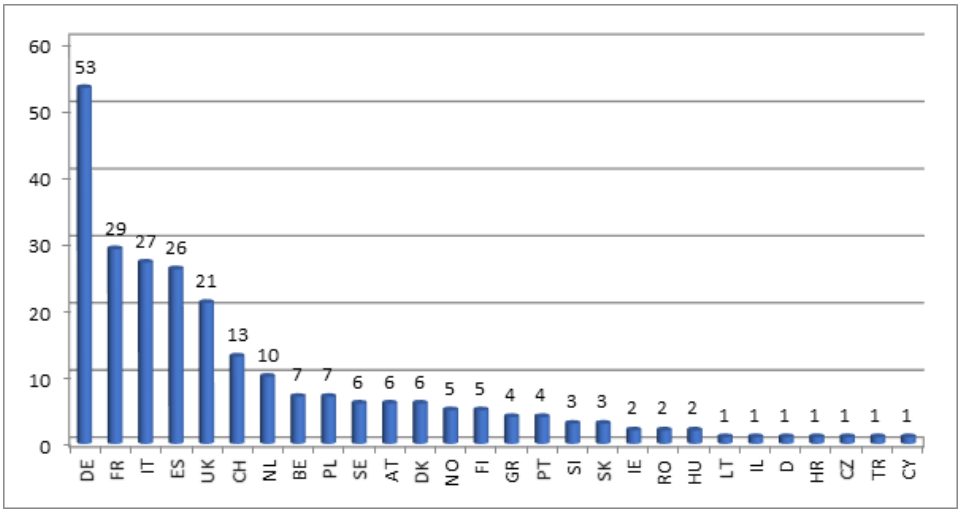


Figure 1: euRobotics Membership: Distribution by country end of 2017

Membership is divided between academic and industrial organisations and contains a broad cross section from European countries, organisation types and sizes as shown in Figure 2. The category "Other" includes associations, or e.g. governmental institutions such as regions. The share of SMEs among the industrial members is shown as well.

The membership includes major global suppliers of robotics technologies such as ABB, Kuka, Comau, Finmeccanica and Thales as well as successful supplier SMEs as well the best university labs and technology centres together with global user companies such as BMW, Procter and Gamble, DHL, Chevron, Continental, Nestle, GE, Otto Bock and Gassco.

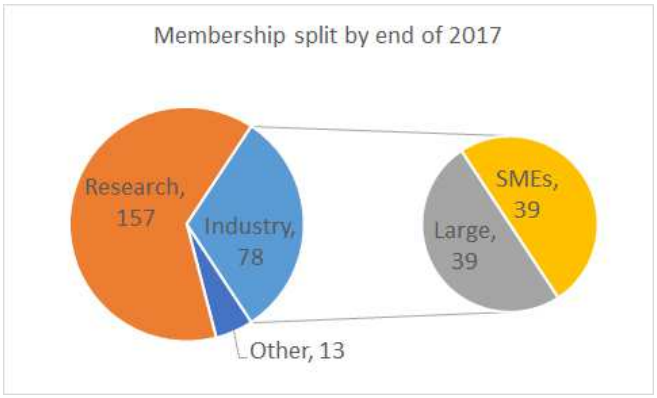


Figure 2: euRobotics membership: Membership categories and SME ratio among the industrial members end of 2017

As the profile of the Association's membership develops, the membership fees will be reviewed to ensure they are fair and balanced with the goal of reaching self-sustainability by 2020.

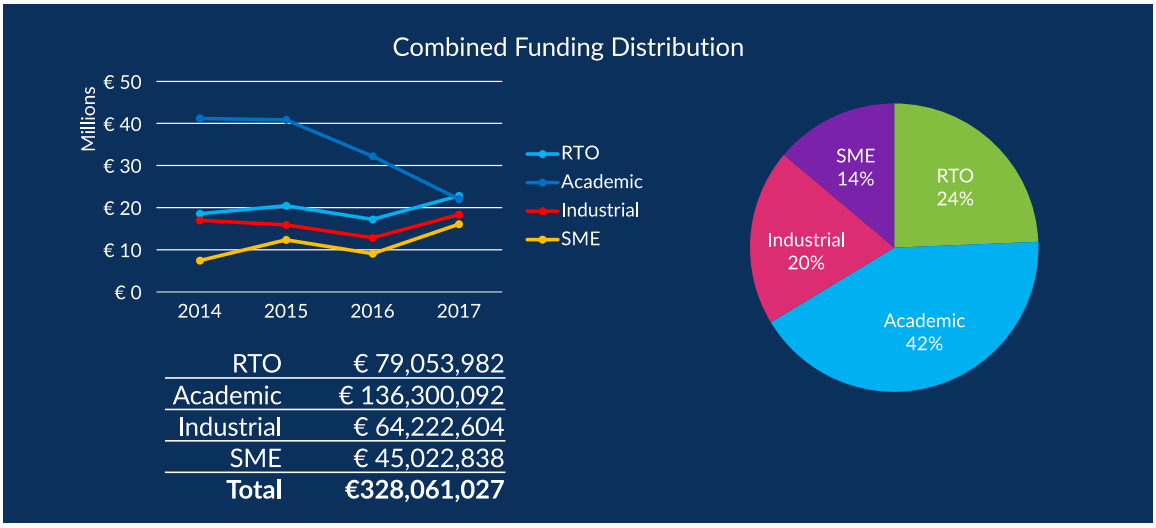
3. MONITORING OF THE OVERALL PROGRESS SINCE THE LAUNCH OF THE CPPP

3.1. ACHIEVEMENT OF THE GOALS OF THE SPARC CPPP

This year marks the mid-point in Horizon 2020 and provides an opportunity to analyse the first half of the framework programme and to examine achievement against the goals of SPARC stated above.

Key factors in an assessment of these goals is to examine the impact of SPARC through the events it organises and through the response to the work programme calls. It is too early to assess its longer-term impact on these objectives as the first SPARC projects have only just completed during 2017.

Critical to achieving the SPARC goals is the engagement of Industrial organisations in the work programme and in the SPARC events.



RTO	€ 79,053,982
Academic	€ 136,300,092
Industrial	€ 64,222,604
SME	€ 45,022,838
Total	**€328,061,027**

Figure 3: Total funding distribution between participant types

Figure 3 shows the accumulated figures for all applications to the ICT robotics work programme from 2014-2017. This shows that over these first years the industrial and SME engagement in the work programme calls has risen in terms of funding allocated. It should also be remembered that a number of the funded actions involve cascade funding that is currently allocated to RTOs and will be redistributed mostly to SMEs.

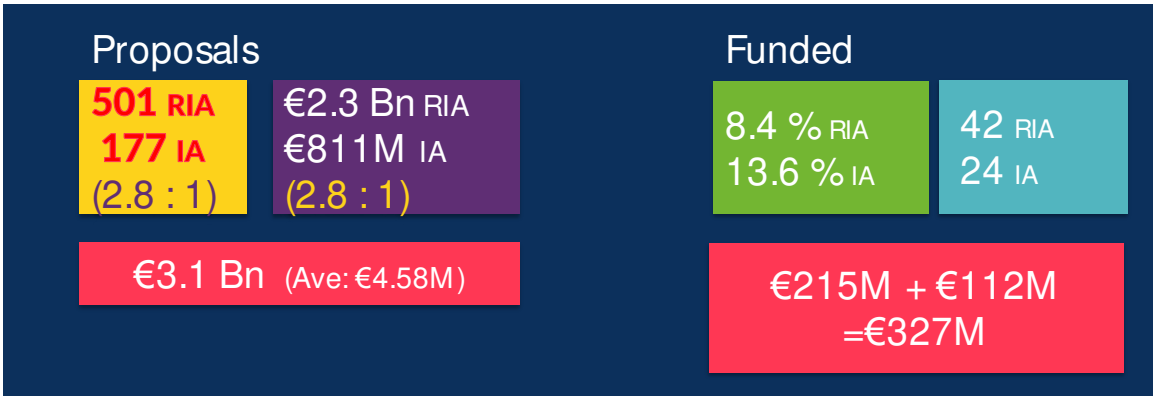


Figure 4: Overall first half accumulated funding and proposal data

Figure 4 provides accumulated figures from across the 2014-2017 work programme calls indicating that there is significant potential in the community that is untapped based on the fact that the total requested funding is some nine times the available budget.

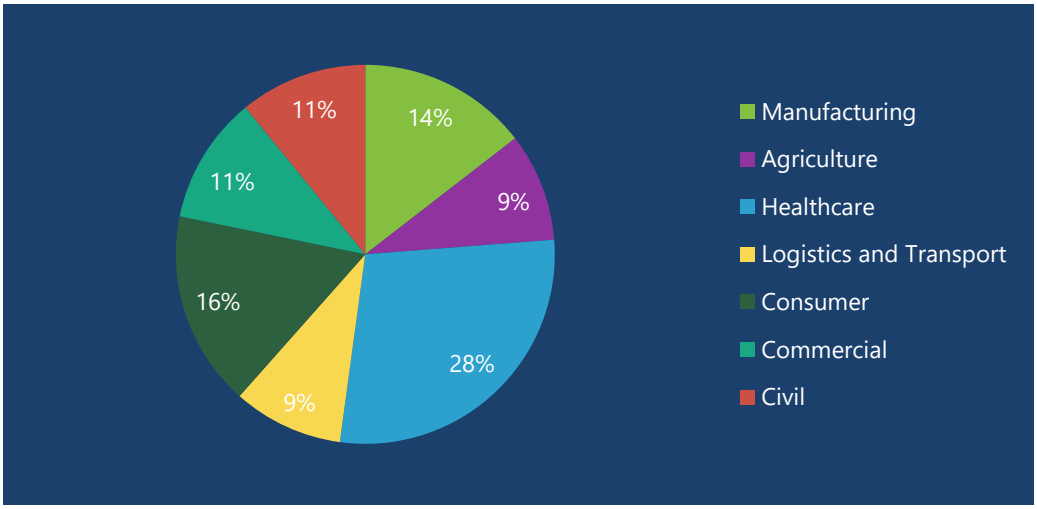


Figure 5: Total proportion of applications in each domain

Figure 5 shows the spread of proposals addressing the different domains set out in the 2014 SRA indicating that a broad range of industrial applications and areas are addressed by European robotics stakeholders.

Attendance at the European Robotics Forum (ERF) has increased year on year providing evidence of the extended reach of SPARC in addressing new markets and promoting robotics across Europe. ERF is the largest European robotics event and has grown each year. The value to business can be assessed by the focus within ERF on the manufacturer exhibition that accompanies it and the interest shown in showcasing SPARC inspired projects through a dedicated track.

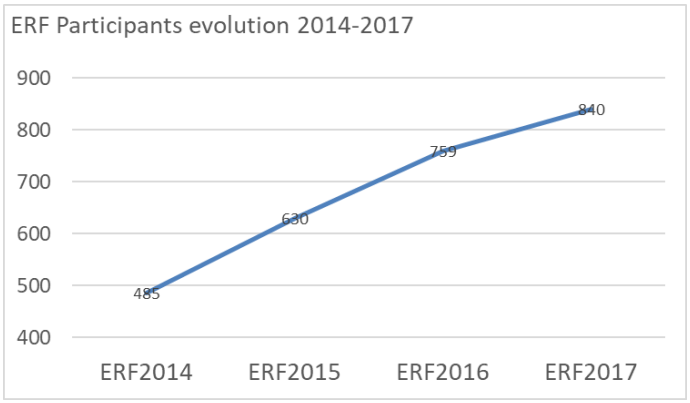


Figure 6: Attendance at ERF 2014-2017

The increased mobilization of stakeholders is also reflected by the increase of the number of ERW events between 2014 and 2017.

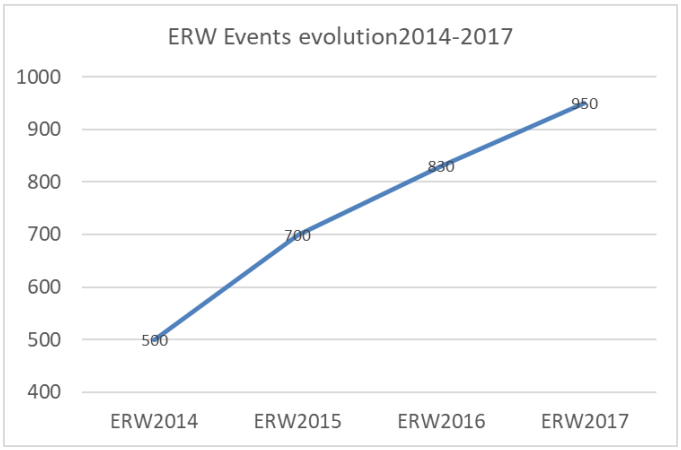


Figure.6a: Number of events during the European Robotics Week 2014-2017

3.2. PROGRESS ACHIEVED ON KPIS

Methodology: The objective of SPARC in assessing the KPIs has always been to build a picture of the service and industrial uptake of robotics rather than the narrow perspective of only considering funded actions, which has the added difficulty that impact will not be seen in the market until 10-20 years.

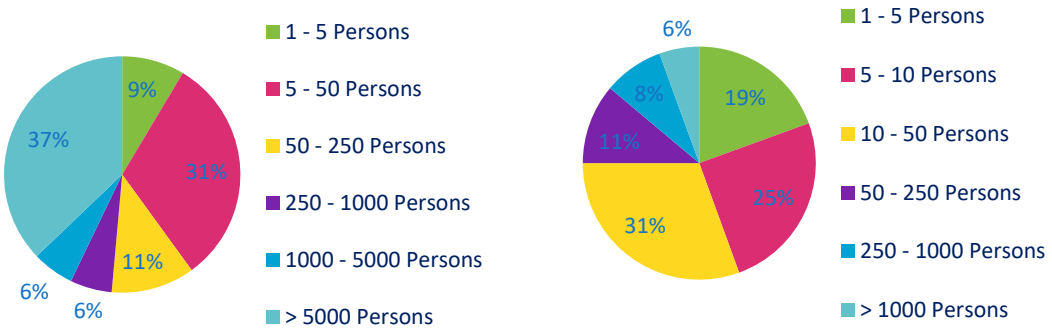
The method used to calculate the KPIs for SPARC has been changed this year to rely on a direct survey approach in calculating KPI metrics. In 2016 direct survey methods was trialled in parallel with the method used in 2014-2016, which was based on statistics from the International Federation of Robotics (IFR) annual survey. The conclusion from the trial was that a direct full survey could potentially overcome some of the translation and currency exchange issues inherent in the IFR data and in addition would allow deeper questioning of investment and innovation. The KPI metrics for 2017 are therefore exclusively derived from a series of three surveys covering industrial, academic and RTO members of euRobotics

aisbl[1]. In order to gain an industry wide picture results in this monitoring report are based on responses from euRobotics members that have been scaled in proportion to the community whole community of members.

Sample representation: The following table illustrates the response rates in each category to the survey.

Respondant Type	Number in euRobotics	Number responding	EC Active Respondents
Industrial (non SME)	39	17 (49%)	7 (9%)
Industrial (SME)	39	19 (44%)	10 (14%)
RTO	55	23 (42%)	*(Not asked)*
Academic Organisations	103	35 (34%)	*(Not Asked)*

Size Spread of industrial respondents



a) b)

Figure 7: Size distributions for industrial respondents a) Total company size, b) Number working in robotics

The number of EC active SME respondents to the survey represents 14% of the total number of unique SME participants in the ICT robotics Horizon 2020 work programmes which number 69 for the actions active in 2017, and non-SME industry respondents, which number 81, represent 9% of unique non-SME industry participants in ICT robotics Horizon 2020 work programmes. Which is below the level needed to achieve a statistically significant sample.

Mobilised Private Investments: From the data gathered from industrial respondents the average additional spend per project for SMEs is €79k per annum per project and for non-SME industrial respondents was €26k per annum per project. While these figures may suffer to some extent from the statistics of small numbers they provide a first indication of the scale of additional expenditure. Respondents were asked to consider all additional expenditure outside of the 25% overhead and to include the following categories in their estimate: Additional

[1] Note that this is in contrast to other cPPPs who survey the particpants in funded actions.

uncovered overheads, Infrastructure related costs, Maintenance and consumable costs not charged to the project, Equipment costs (proportionate for large assets), additional personnel costs and Other costs. Therefore scaled against sample size and against the total engagement of SMEs and Non-SMEs in currently running Horizon 2020 projects the total additional mobilised investment in funded actions combined with the direct industry contribution is €24M.

Respondents were also asked to estimate the total investment in robotics in their companies and sections using the same set of categories excluding the figures for direct funding of funded actions. There are alternative ways of interpreting the data provided and in doing so it is important to consider the skewed profile of companies in robotics where there is a predominance of smaller SMEs and very large global corporations. Therefore basing figures of total investment on averages may only provide an upper bound of investment, while basing it on medians may provide a lower bound.

For SMEs the median and average were €200k and €1.1M per annum and for non-SMEs at €500k and €3M per annum. Scaling these figures against the participants in Horizon 2020 projects, where there are some 73 non-SME unique participants in Horizon 2020 during 2017 and some 69 unique SME participants, gives an estimate of the mobilised private investment median and average of €97M and €458M against €80M of public investment giving leverage ratio upper and lower bound of 6.0 and 1.5. It is reasonable to assume that the actual leverage ratio is an average of these two extremes at about 3.7. This places it close to the leverage range calculated in previous years (2.6-3.1) which, considering the completely different approach, lends some confidence to the value.

New skills and jobs: The current survey data is sparse with respect to job creation and job type creation. Currently a scaled estimate would suggest that some 161 jobs have been created by funded actions in 2017 this amounts to slightly more than one job per unique participant and less than one per participation. Job creation not related to funded action is far higher with one respondent indicating over 1000 jobs created related to robotics in 2017. Scaling the jobs not related to funded actions provides an estimate of some 2600 jobs created by euRobotics industrial members. Since euRobotics industrial members represent only the robot production sector this figure should be taken as a lower estimate of the total number of jobs created related to robotics.

With respect to the numbers of new job types created the survey respondents report some 27 new job types, however there is no way to identify if these represent 27 mutually exclusive job types without detailed information to assess the similarity between the 27. In future surveys a refinement of this question will be considered. Given the nature of the current data there is little validity in scaling to the community.

Impact on SMEs: The impact on SMEs has been partly indicated in the responses to the other KPIs. With respect to impact the survey indicates that 63% of SMEs have experienced turnover increase from robotics innovation. Current survey data is too sparse to measure the impact of funded actions on SMEs and in addition the extensive use of cascade actions in Robotics ICT calls means that it is difficult to assess impact based on actions that are still on-going. SPARC will track this effect over the next few years as these cascade, or similar, actions complete.

Significant Innovations: The survey gathers data about robotics innovation impact and accumulated results across a variety of innovation impacts indicate that some 56% of companies have experienced major impact from robotics technology in 2017 and 97% have experienced some positive impact from robotics innovation. The diversity of impact means that it is impossible to specifically identify the nature of this impact but data from the survey indicates that individual companies typically experience impact from multiple factors with Technology Transfer being the most often cited reason for major impact. One conclusion from this result, illustrated in Figure 8, is that technology transfer agreements may a better indicator of innovation significance than patents.

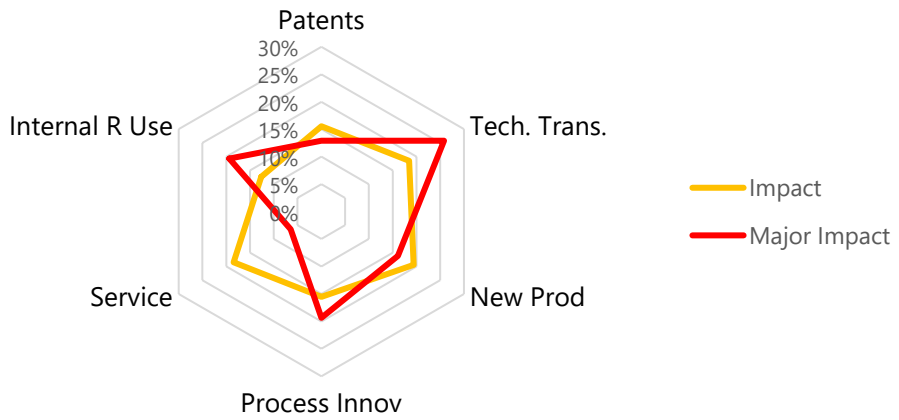


Figure 8: Categorisation of sources of impact and major impact for industrial respondents

Summary

4.1a Mobilised private investments in funded actions:	***€24,000,000***
4.1b Other mobilised private investments	**€277,000,000**
4.1c Estimated leverage ratio	**3.6**
4.2a New Jobs created in funded actions	**160**
4.2b New robotics related jobs created	**2600**
4.2c New job profiles declared	**27**
4.3a Impact of SPARC on SMEs: increased turnover	**68%**
4.3b Impact of SPARC on SMEs: increased turnover as a result of robotics activity	**63%**
4.4a Impact of Innovation: Positive impacts from current actions	**92%**

4.4b Impact of Innovation: High impacts from current actions	**40%**
4.4c Impact of Innovation: Benefits from prior actions	**50%**
4.4d Impact of Innovation: Positive impacts from robotics	**97%**
4.4e Impact of Innovation: High impact from robotics	**56%**

Table of estimated KPI Values

3.3. EVOLUTION OVER THE YEARS .....

Figure 9:Horizon 2020 ICT Robotics funded projects and completion year, funding level and consortia composition

Figure 9 provides a graphical overview of the actions funded to date and their composition. During the first half of Horizon 2020 the focus has been on creating strong interactions between academic and industrial stakeholders.

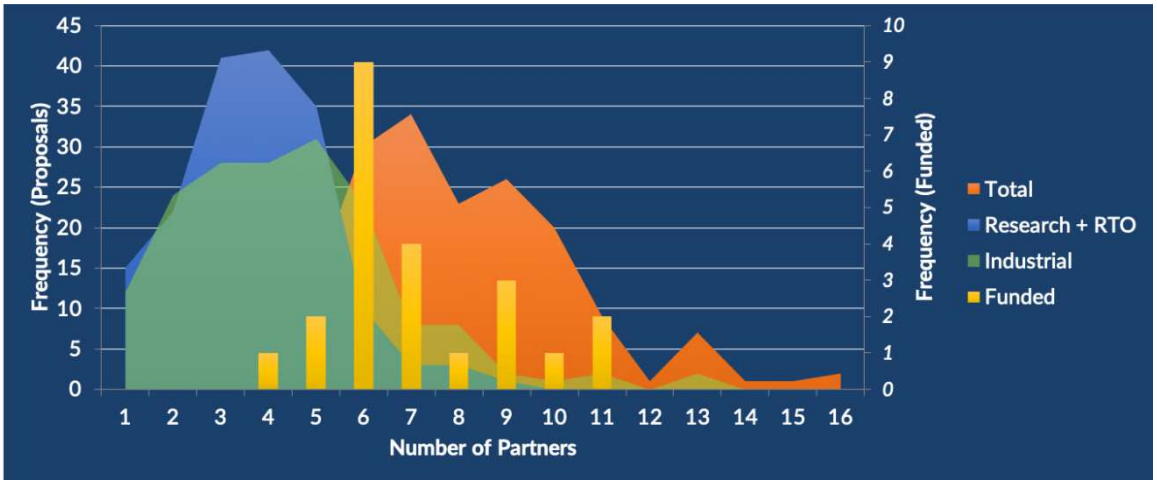


Figure 10: IA Consortia shape across the first half of Horizon 2020

Figure 10 provides some insight into the shape of consortia for IA across all proposals in the 2014-2017 call set. It shows that proposals typically have 4-5 industrial partners and 3-4 academic partners. This clearly indicates the strong engagement of industrial and end users in IAs. A similar graphic for RIAs clearly shows greater academic engagement in consortia for RIAs. This level of industrial engagement in Robotics ICT calls, when compared to FP7, indicates a strong underlying connection between the academic and industrial stakeholders in the community and can be seen as a major achievement of SPARC.

Mid-term H2020 analysis

The analysis of the cPPP mid-term evaluation report in 2017 (doi:10.2777/699241) has raised a number of issues but specific comment is needed on the level of SME engagement.

The SME participation rate requires a deeper analysis to uncover the true picture. As reported above SMEs are hesitant to participate in RIAs and IAs. To overcome this, the "cascading funding" (Financial support to third parties, FSTP) according to Annex K has been introduced in a number of robotics calls, however this means that Commission statistics only show the funding of the beneficiaries, typically RTOs, rather than the cascaded beneficiaries which are typically SMEs (Robotics and End User). Examples of projects which use cascading funding mechanisms, vouchers or awards are ECHORD++ (FP7), ROBTT-NET, RobMoSys, ROSIN, COVR, ESMERA, EUROBENCH, and System4Robotics. In addition, I4MS projects such as HORSE or RECONCELL also use cascading funding. Each of these projects may cascade to some 20-30 SMEs each. It is therefore important to take this redistribution to SMEs into account when considering the engagement of SMEs in SAPRC, doing so will result in a far higher SME engagement level.

4. OUTLOOK AND LESSONS LEARNT

Robotics and AI are developing fast. The usual innovation mechanisms provided by H2020 might appear to be too slow in certain cases, especially for SMEs. DIH networks have been identified as promising mechanisms to cater the needs of SMEs and to support innovation. Therefore, an important step taken in 2017 is the decision to opt for DIH networks in the four Prioritized Application Areas, associated with coordination mechanisms between them. These hubs are seen as a key driver of growth and dissemination into new markets and a means to accelerate SMEs able to grow into new markets and create stronger value chains. After a series of workshops and a larger Information and Brokerage Day in late 2017 (and early 2018), the next step is to cooperate with the successful consortia that will be selected to implement networks of DIHs in the four PAAs. Here, a significant coordination and alignment is necessary to agree on common timelines, to avoid conflicting messages to the stakeholders, and to identify and support the creation of synergies between the different PAAs. A key element for this will be the CSA resulting from DT-ICT-02-2018 b). In addition, an "uplink" to other hub networks and the pan-European catalogue, hosted by the JRC, will be strengthened.

This is also important to champion the development of industry-led standards and to stimulate the creation of value chains.

As a specific view of the robotics landscape is appropriate, more collaboration with other PPPs is a key element of the 2018 activities, alignment regarding technologies, and especially the inclusion of AI are of high priority. Therefore, euRobotics has established systematic contacts to other PPPs. The most natural cooperation seems to be with Factories of the Future (FoF, EFFRA association), Big Data Value (BDVA), AIOTI, and Photonics. Cybersecurity is also an important topic which needs to be considered in all robotic applications, as there is barely a stand-alone system which is not connected to the internet. Therefore, euRobotics, BDVA and AIOTI agreed on writing a joint paper on "Physical AI" where AI is applied in applications that act in the physical world. This combination seems to have a much broader impact that purely virtual AI applications and is likely to transform all sectors and impact the future employment situation. This joint paper is expected first half of 2018.

This also requires to engage in the skills discussion and to look into new ways not only for basic education, but also into re-skilling and up-skilling of existing work force.

FURTHER INFORMATION

[1] https://www.eu-robotics.net/sparc

ANNEX I PART 1 – COMMON PRIORITY KEY PERFORMANCE INDICATORS

	Key Performance Indicator (KPI)	Value in {2017}	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Mobilised Private Investments	KPI provided as an estimate in € of annual spend on all SPARC related funded actions operating in 2017: €24,186,135 KPI provided as estimates in € of direct investment by the organisation in robotics related R&D&I activity in 2017 scaled by Horizon 2020 unique participations KPI (Average Base): €458,000,000 KPI (Median Base): €97,200,000		From the CA	See detailed calculation schemes in document "KPI 2017 Calculations.docx" and explanation in the document "KPI rational.docx"
2	New skills and/or job profiles	Number of new jobs declared as a result of funded actions in 2017: 14 Approximate percentage of funded actions covered by the survey: 9% Scaled number of jobs generated through funded actions: 161 Number of new jobs declared in SMEs as a result			See detailed calculation schemes in document "KPI 2017 Calculations.docx" and explanation in the document "KPI rational.docx"

		of robotics related activity in 2017: 39 Number of new jobs declared in non-SMEs as a result of robotics related activity in 2017: 1131 Number of new SME jobs scaled to euRobotics membership: 80 Number of new non-SME jobs scaled to euRobotics membership: 2594 Number of declared new job types: 27			

3	Impact of a cPPP on SMEs	Percentage of companies reporting a turnover increase: 79% Percentage of companies reporting a turnover increase as a result of robotics innovation: 68% Percentage of SMEs reporting a turnover increase: 68% Percentage of SMEs reporting a turnover increase as a result of robotics innovation: 63% Percentage of SME in Industrial participations in current funded actions.: 46% (EXCLUDING FSTP)			See detailed calculation schemes in document "KPI 2017 Calculations.docx" and explanation in the document "KPI rational.docx"
4	Significant Innovations	Percentage of positive innovation impacts from current actions: 92% Percentage of high impacts from current actions: 40% Percentage of EC active respondents reporting benefits from previous funded actions: 50% Percentage of positive impacts from robotics: 97%			See detailed calculation schemes in document "KPI 2017 Calculations.docx" and explanation in the document "KPI rational.docx"

		Percentage of high impacts from robotics: 56%			

ANNEX I PART 2 – SPECIFIC KEY PERFORMANCE INDICATORS FOR THE SPARC CPPP

	KPI domain	Key Performance Indicator (KPI)	Value in {2017}	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Strategic performance	Market share of European robotics producers	Market statistics on European Global Performance have a redefined structure making comparisons with previous figures difficult to analyse.			Following mid term review a new SRIA in 2019 will redefine goals in a more sustainable way.
2	Strategic performance	Strong industrial presence in PPP	31% industrial members in the association About 38% industrial applicants	0	More than 200 active companies in the PPP	
3	Strategic performance	SME presence in PPP	15% SME members in the association (50% of all industrial members)	0	More than 15% of all companies should be SMEs	

4	Operational performance	Number of active Topic Groups	32 active Topic Groups	Topic Groups as a means to produce content for the SRA/MAR have only been introduced with the PPP	No specific number	Topic Group operation has been reviewed Mid Term Updates going forward will be implemented in 2018.
5	Operational performance	Carry out roadmapping/ regular updating of SRA and MAR	No update to the MAR was published in 2017 as the work programme relates purely to DIH calls. A revised SRIA is planned for 2019. Joint Roadmaps with other cPPPs are planned.	No MAR/SAR in FP7	Annual updates of MAR	
6	Operational performance	Cooperation with other PPPs and other H2020 areas	A stronger collaboration with other PPPs started in 2017. euRobotics identified several collaboration topics, especially on a joint AI strategy. Joint	0	No specific number	

			workshop with AI community held during 2017 Discussions on joint Roadmaps started with BVDA and AIOT The PPPs to start closer collaboration (without losing the individual profiles) are EFFRA/FoF, BDVA / Big Vata Value PPP, Photonics, and Cybersecurity. Also the AIOTI initiative is an important partner. With other associations, a collaboration needs to be further explored.			

ANNEX I PART 3 – CONTRIBUTION TO PROGRAMME-LEVEL KPIS

	Key Performance Indicator	Definition/Responding to question	Type of data required	Data [Commission]	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Patents			To be extracted from project database	n.a. [new cPPP under H2020]		
2	Standardisation activities (project level)			To be extracted from project database	*Not reported*	No target	

	Contributions to new standards (PPP level)						Members participated in standardization activities such as ISO TC 299 "Robotics, see collection of standardization newsletters https://www.eu-robotics.net/eurobotics/about/downloads/index.html
3	Operational performance	Time-to-grant		216 days			
5	**H2020 - LEIT** - Number of joint public-private publications	Number and share of joint public-private publications out of all LEIT publications.	Properly flagged publications data (DOI) from LEIT funded projects	To be extracted from project database			

ANNEX II - SECTION 2.2 MOBILISATION OF STAKEHOLDERS AND OUTREACH

European Robotics Forum 2017 press coverage

Media	Date	Link
Herald Scotland	15.02	http://www.heraldscotland.com/business/15091687.Event_to_showcase_robotics_expertise/
Cube Tech Fair newsletter	15.03	http://us13.campaign-archive1.com/?u=6e3444426a8e12531d4d9bc57&id=3bf3d465fa&e=9ea15bffd2
Irish Tech News	16.03	http://irishtechnews.ie/living-and-working-with-robots-european-robotics-forum-2017-22-24-march-edinburgh/
UK-RAS	N/A	http://hamlyn.doc.ic.ac.uk/roboticsweek2017/events/european-robotics-forum-2017
Robohub	20.03	http://robohub.org/living-and-working-with-robots-european-robotics-forum-to-focus-on-robotics-markets-and-future-of-work/
BBC	20.03	http://www.bbc.com/news/uk-scotland-39330441
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Robot.lu	21.03	http://www.robota.lu/living-and-working-with-robots-european-robotics-forum-to-focus-on-robotics-markets-and-future-of-work/

BBC Click	21.03	http://www.bbc.co.uk/programmes/p04wsf5h
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- **euron-dist traffic**

Social media stats
#ERW2017 hash tag performance

TWEETREACH SNAPSHOT FOR

#ERW2017

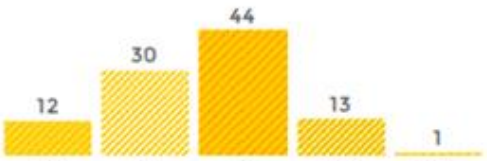
ESTIMATED REACH

583,045

ACCOUNTS REACHED

EXPOSURE

848,379 IMPRESSIONS



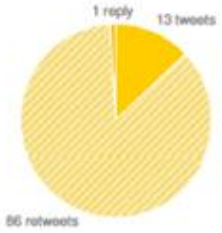
Bars show number of tweets sent by users with that many followers

ACTIVITY

100 TWEETS

78 CONTRIBUTORS

17 HOURS



TOP CONTRIBUTORS

360.1k IMPRESSIONS — @alexstubb

48 RETWEETS — @Ansip_EU

51 MENTIONS — @SPARCrobotics

MOST RETWEETED TWEETS

48 Andrus Ansip @Ansip_EU
The @EU_Commission has long understood the importance of #robots & #AI. In 2013 it set up @SPARCrobotics, a €2.8 bi...
twitter.com/i/web/status/9...

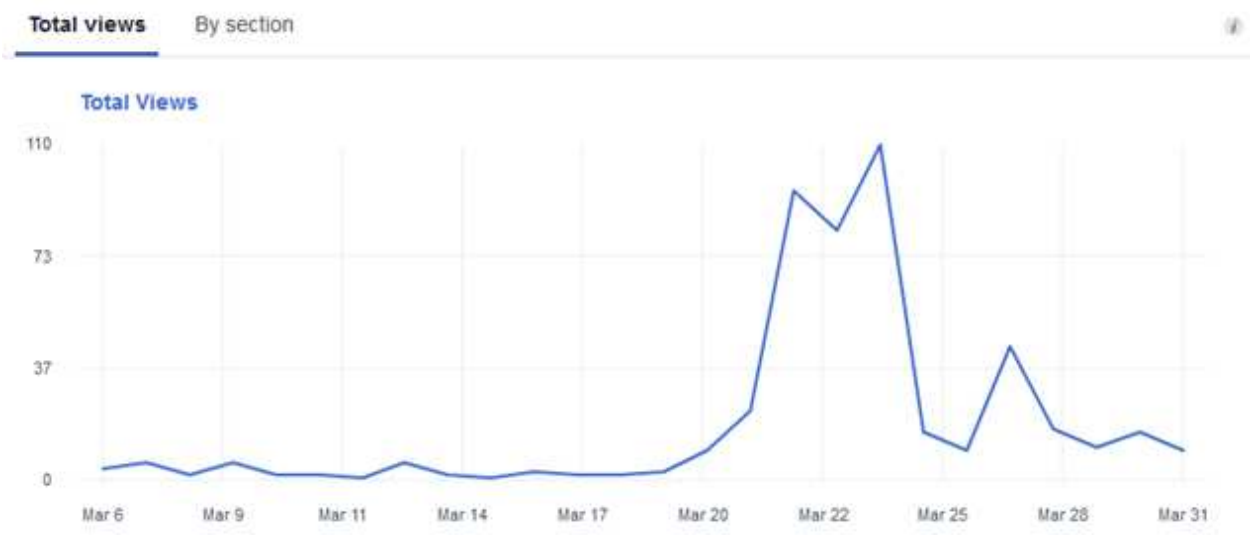
6 mercedes ruiz @londones
Cerramos #streetbot con el mensaje de alguien q oteaba, a dos meses, su adiós al aula y ...#erw2017 @HispaRob... twitter.com/i/web/status/9...

5 Mayte Bravo @Maytetwo
Resumen de los trabajos de los alumnos de #AHGetafe con @juliagpalomar y #SAED @ahsaeddatsur para la #ERW2017... twitter.com/i/web/status/9...

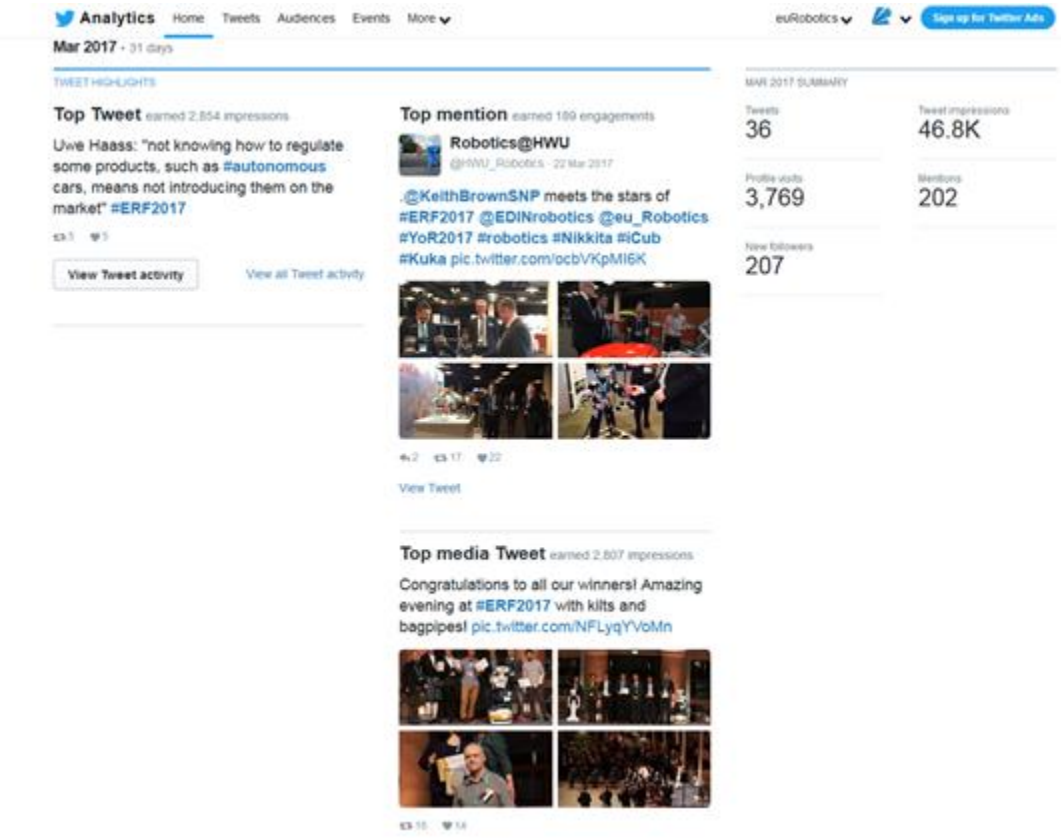
The most active social media authors

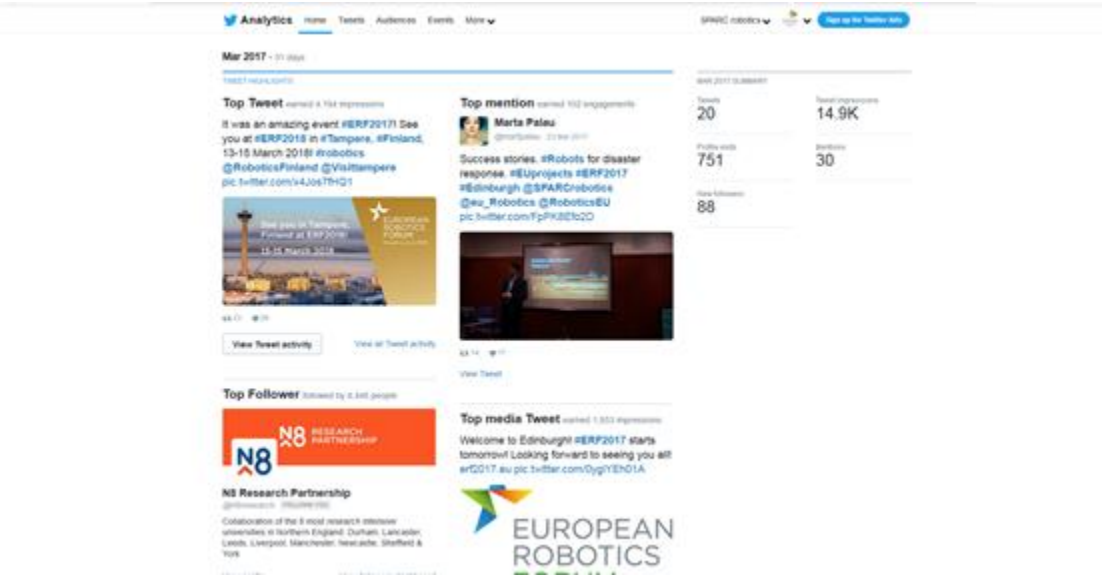
	Author	Site	Influence	Mentions
1	EUSciComm		28861	38
2	PALRobotics		5102	24
3	londones		10627	20
4	eu_Robotics		4384	20
5	Mercedes Ruiz		133	20
6	SPARCrobotics		1173	11
7	ThiloZimmermann		97	11
8	Stella_Vaskoudi		1083	7
9	sohjoabaltic		0	6
10	nievescout		2053	6

Facebook page stats during #ERF2017 (21-23 March 2017)



Twitter stats during #ERF2017 (21-23 March 2017)





Smart regions with smart robots, 10 May 2017, Brussels
Facebook page stats

Twitter Stats