EXCELLABUST

EXCELLING LABUST IN MARINE ROBOTICS

Periodic Technical Report

PART A

Project Acronym:	EXCELLABUST
Grant Agreement number:	691980
Project title:	Excelling LABUST in marine robotics
Funding:	Horizon2020 Twining
Call:	H2020-TWINN-2015
Type of action:	CSA
Start date of project:	1st January 2016
Duration:	36 months
Period covered by the report:	from 01/01/2016 to 31/12/2016
Periodic report	1st
Project website:	http://excellabust.fer.hr/
Delivery date:	
Version:	1.0
Lead participant	UNIZG-FER

Dissemination level:		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691980.

SUMMARY FOR PUBLICATION

Laboratory for Underwater Systems and Technologies (LABUST) at the University of Zagreb Faculty of Electrical and Engineering (UNIZG-FER) in Croatia positioned itself in the last years as the regional leader in marine robotics: LABUST has the required technologies, people, infrastructure, and experience in field experiments. What LABUST is missing is research excellence that will allow it to fully exploit and bring available resources to a level compatible with internationally leading institutions in the area of marine robotics. The **main goal** of EXCELLABUST project is to address networking gaps and deficiencies between UNIZG-FER and internationally leading counterparts at EU level, by significantly strengthening marine robotics research within LABUST through twinning with expert partners.
The **first objective** is to increase UNIZG-FER marine robotics scientific excellence and innovation capacity, and raise staff's research profile within three strategic research domains (SRDs) that are aligned with the Strategic Research Agenda for Robotics in Europe 2014 - 2020: 1) mapping and perception, 2) advanced navigation, guidance, and control, and 3) autonomy and cognition. The **second objective** is to increase UNIZG-FER scientific involvement and visibility. These objectives will be reached through a set of strategic measures: staff exchanges and expert visits for providing S&T knowledge transfer; on-site trainings for providing hands-on S&T experience; innovation management trainings; organization of research-industry workshops for strengthening links to marine robotics industry; and joint organization of summer schools with strong emphasis on application of marine robotics for strengthening links to marine robotics end-users from marine biology, marine archaeology, oceanography, marine security, etc. In order to measure the quality of the twinning action, key impact indicators are defined and they will be monitored during and after the EXCELLABUST project lifetime.

1. Summary of the context and overall objectives of the project (For the final period, include the conclusions of the action)

Laboratory for Underwater Systems and Technologies (LABUST) at the University of Zagreb Faculty of Electrical and Engineering (UNIZG-FER) in Croatia positioned itself in the last years as the regional leader in marine robotics: LABUST has the required technologies, people, infrastructure, and experience in field experiments. What LABUST is missing is research excellence that will allow it to fully exploit and bring available resources to a level compatible with internationally leading institutions in the area of marine robotics. The **main goal** of EXCELLABUST project is to address networking gaps and deficiencies between UNIZG-FER and internationally leading counterparts at EU level, by significantly strengthening marine robotics research within LABUST through twinning with expert partners.
The **first objective** is to increase UNIZG-FER marine robotics scientific excellence and innovation capacity, and raise staff's research profile within three strategic research domains (SRDs) that are aligned with the Strategic Research Agenda for Robotics in Europe 2014 - 2020: 1) mapping and perception, 2) advanced navigation, guidance, and control, and 3) autonomy and cognition. The **second objective** is to increase UNIZG-FER scientific involvement and visibility. These objectives will be reached through a set of strategic measures: staff exchanges and expert visits for providing S&T knowledge transfer; on-site trainings for providing hands-on S&T experience; innovation management trainings; organization of research-industry workshops for strengthening links to marine robotics industry; and joint organization of summer schools with strong emphasis on application of marine robotics for

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strengthening links to marine robotics end-users from marine biology, marine archaeology, oceanography, marine security, etc. In order to measure the quality of the twinning action, key impact indicators are defined and they will be monitored during and after the EXCELLABUST project lifetime.

2. Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far (For the final period please include an overview of the results and their exploitation and dissemination)

Objective 1: Increase UNIZG-FER marine robotics scientific excellence and innovation capacity, and raise staff's research profile

Overall we have organized **16** events that have contributed to the accomplishment of this objective.

- **S&T knowledge transfer:**
  - **2** staff exchanges from UNIZG-FER to partner institutions (each in the duration of two months)
  - **6** expert visit invited talks at UNIZG-FER
  - **2** expert visit tutorials by UdG and CNR at UNIZG-FER
- **hands-on S&T experience**
  - **1** on-site training by CNR in Genova, Italy
- **knowledge on innovation management**
  - **5** innovation management trainings on various topics

Objective 2: Increase UNIZG-FER scientific involvement and visibility

Overall we have organized **13** events that have contributed to the accomplishment of this objective.

- **strengthen links to marine robotics industry:**
  - CNR organized "EU-funded projects in marine robotics and applications workshop - EMRA'16" in Newcastle, UK
  - **8** conferences and industrial events
- **strengthen links to marine robotics end-users**
  - **5** open-door events, **2** of which were organized at UNIZG-FER

3. Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

The overall progress of the project as well as the impact of the results is best demonstrated through a list of Key Impact Indicators (KIIs) that have been defined in the project proposal. Even though not all KIIs have shown to be useful since they cannot be directly influenced through the set of proposed measures (e.g. the success rate in proposal funding), we provide a full table with the KIIs as they were defined in the proposal. Some initial indicators have also been changed relative to the original table of indicators due to slightly different methodology.

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KII 1. Publications[1] - This indicator specifically addresses Objective 1 and is a clear demonstrator of the national impact. Out of the list of specific measures to implement the strategy within EXCELLABUST project, the greatest influence on increasing the value of this indicator will have staff exchanges and trainings.			
	2010 – 15	M36	M48
1.1. Number of publications in top 10% peer-reviewed journals	0	1	2
Current status (2010 – 2016): **0**			
1.2. Number of public. in Q1/Q2/Q3/Q4 peer-reviewed journ.[2]	1/2/1/2[3]	3/3/5/5	4/4/5/5
Journal publications in 2016: 4 (0/1/3/0) Total current status (2010 – 2016): **10 (1/3/4/2)** List of journals: *IEEE robotics & automation magazine (2015: Q2)* *Annual reviews in control (2015: Q2)* *Journal of intelligent & robotic systems (2012: Q3)* *Journal of field robotics (2011: Q1)* *Brodogradnja (2010: Q4; 2011: Q4; 2015: Q3)* *Journal of Sensors (2015: Q3)* *Marine technology society journal (2015: Q3)* *International journal of adaptive control and signal processing (2015: Q2)*			
1.3. Number of peer-reviewed conference publications	37[4]	50	57
Current status (2010 – 2016): **46**			
1.4. Number of citations[5]	367	580	700
2010 – 2015: [228 (Mišković) + 506 (Vukić)]/2 = 367 2016: [38 (Mišković) + 52 (Vukić)]/2 = 45 Total current status (2010 – 2016): **412 (+12%)**			

KII 2. Participation in national and EU level research and innovation programmes - This indicator also addresses Objective 1, by measuring participation in research and innovation programmes. It is expected that the greatest influence on increasing the value of this indicator will have expert visits and innovation management trainings.			
	2010 – 15	M36	M48
2.1. Number of national and international proposal submitted	~ 40	8-10 p.a.	8-10 p.a.
Current status (2016): **~20**			

[1] The analysis has been made based on publications by Prof Zoran Vukić (LABUST Director) and Prof Nikola Mišković (Coordinator) for the sake of simplicity. Publications from the database https://bib.irb.hr/index.html?lang=EN are taken into account.

[2] Journal ranking is taken from ISI Web of Knowledge – Journal Citation Reports

[3] Original numbers were 1/0/2/2, however since the project approval new publications and journal ranking is available, hence the new status of publications ranking in the period 2010 – 2015.

[4] Original number was 27 but more conference papers were published since the project proposal submission and project start.

[5] Citations are taken from Google Scholar and an average value of citations for Prof Zoran Vukić and Prof Nikola Mišković are taken as an indicator for the sake of simplicity. Due to this change in methodology, the target numbers are somewhat changed (it used to be 95 / 150 / 180) but the relative percentage in increase has still remained.

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2.2. Percentage of national and international proposal granted[6]	~ 20%	~ 40%	~ 40%
Current status (2016): **~4 (25%)**			

KII 3. Innovation and connection with industry - This indicator addresses Objective 2, by measuring the level of scientific involvement and visibility, through linking with industry. It is expected that the greatest influence on increasing the value of this indicator will have EMRA workshops and innovation management trainings.			
	2010 – 15	M36	M48
3.1. Number of collaboration agreements with businesses	0	6	8
Current status: **1** 1. INNOVASUB, Turkey			
3.2. Number of patent applications	0	2	3
Current status: **0**			
3.3. Number of commercialization agreements	0	2	3
Current status: **0**			
3.4. Number of new innovative products or services	0	1	2
Current status: **2** 1. autonomous surface marine platform 2. autonomous underwater vehicle BUDDY			

KII 4. Extent of synergy - This indicator addresses Objective 2, by measuring the level of scientific involvement and visibility, through linking with industry as well as end-users. It is expected that the greatest influence on increasing the value of this indicator will have EMRA workshops and BtS trainings. In addition, synergy will be achieved through joint trainings.			
	2010 – 15	M36	M48
4.1. Percentage of joint publications	~ 20%[7]	~ 50%	~ 50%
Current status (2016): 4 of 13 (**31%**)			
4.2. Number of collab. agreements with research institutions	2	7	10
Current status (2016): **2** 1. University of Girona, Spain 2. Divers Alert Network Europe, Malta			
4.3. Number of joint events	1	6	8
Current status (2016): **2** 1. EMRA'16, Newcastle, UK; 2. BtS'16, Biograd na Moru, Croatia			

[6] This KII is very difficult (almost impossible) to influence hence it should not be considered strictly.

[7] The analysis has been made based on publications by Prof Zoran Vukić (LABUST Director) and Prof Nikola Mišković (Coordinator) for the sake of simplicity. Previous number used to be around 15% however this has changed due to some new publications that were made since the proposal submission. Publications from the database https://bib.irb.hr/index.html?lang=EN are taken into account.

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4. Images attached to the Summary for publication

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DISSEMINATION & COMMUNICATION ACTIVITIES

1. Specify the total funding amount used for Dissemination and Communication activities linked to the project: cca 30.000 EUR

2. Specify the number of Dissemination and Communication activities linked to the project for each of the following categories:

Organisation of a Conference	0
Organisation of a Workshop	1
Press release	1
Non-scientific and non-peer-reviewed publication (popularised publication)	1
Exhibition	2
Flyer	0
Training	6
Social Media	1
Website	1
Communication Campaign (e.g. Radio, TV)	2
Participation to a Conference	4
Participation to a Workshop	2
Participation to an Event other than a Conference or a Workshop	2
Video/Film	0
Brokerage Event	0
Pitch Event	0
Trade Fair	1
Participation in activities organized jointly with other H2020 projects	2
Other	

3. Specify the estimated number of persons reached, in the context of all dissemination and communication activities, in each of the following categories:

Scientific Community (Higher Education, Research)	1000+
Industry	150+
Civil Society	100
General Public	1000+
Policy Makers	0
Media	10
Investors	5
Customers	0
Other	

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GENDER

BENEFICIARY NAME	NUMBER OF FEMALE PARTICIPANTS	NUMBER OF MALE PARTICIPANTS	TOTAL NUMBER OF PARTICIPANTS
UNIZG-FER	2	8	10
CNR	2	5	7
UDG	1	5	6
UL	1	4	5

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Periodic Technical Report

PART B

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Grant Agreement number:	691980
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Funding:	Horizon2020 Twining
Call:	H2020-TWINN-2015
Type of action:	CSA
Start date of project:	1st January 2016
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1. EXPLANATION OF THE WORK CARRIED OUT AND OVERVIEW OF THE PROGRESS

Objectives

1.1.1. Objective 1: Increase UNIZG-FER marine robotics scientific excellence and innovation capacity, and raise staff's research profile

Overall we have organized **16** events that have contributed to the accomplishment of this objective.

- **S&T knowledge transfer:**
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- **strengthen links to marine robotics industry:**
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Explanation of the work carried per WP

1.2.1. Work Package 1: Project management

The list of major project meetings for the period is given below.

1. **Kick-off meeting, 21 January 2016, Zagreb (HR)**

All partners gathered in Zagreb for a successful kick-off meeting of the Horizon2020 project EXCELLABUST. Kick-off meeting was held on 21st of January 2016 at the University of Zagreb Faculty of Electrical Engineering and Computing, Zagreb (HR).

2. **Project meeting, 16 June 2016, Newcastle (UK)**

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A project meeting was held in Newcastle (UK) on 16th June 2016, one day after the EMRA'16 workshop. The meeting took place at the University of Newcastle and all partner institutions were represented. In addition to progress reporting, the main topic of the meeting was organisation of the upcoming Breaking the Surface 2016 workshop.

Key impact indicators:

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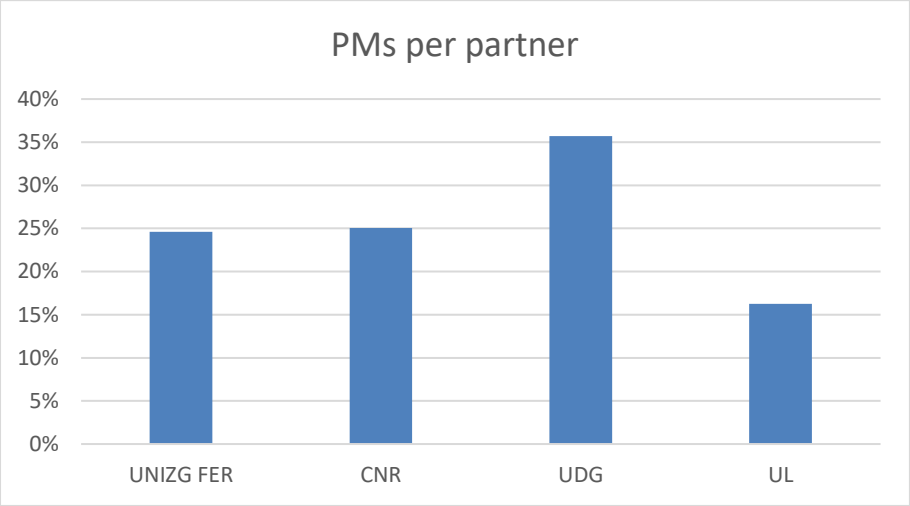
PM consumption by partner



1.2.2. Work package 2: Know-how exchange

- **Short-term staff exchanges**

	TITLE	DATE
1.	Filip Mandić visited University of Girona	Feb – Mar 2016
2.	Nadir Kapetanović visited Consiglio Nazionale delle Ricerche, Genova	Jun – Jul 2016

- **Short-term trainings**

	TITLE	DATE	NAME	INSTITUTION
1.	1st training: Unmanned vehicles - building cooperative control and perception held at CNR, Italy	19-20/01/2016	CNR team	CNR, Genova, IT

- **Expert visits – tutorials**

new publications that were made since the proposal submission. Publications from the database https://bib.irb.hr/index.html?lang=EN are taken into account.

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	TITLE	DATE	NAME	INSTITUTION
1.	Tutorial 1: "High-level architectures and path planning" by UdG	19-20/01/2016	Prof. Marc Carreras and Dr. Narcis Palomeras	UdG
2.	Tutorial 2: "Modelling, identification and motion estimation of unmanned marine vehicles" by CNR	24-25/05/2016	Massimo Caccia	CNR

- **Expert visits – invited talks**

	TITLE	DATE	NAME	INSTITUTION
1.	"Girona Underwater Vision and Robotics lab: AUVs for inspection and intervention"	20/01/2016	Prof. Marc Carreras	UdG
2.	"Towards heterogeneous cooperative field robotics: the CNR-ISSIA experience"	22/01/2016	Massimo Caccia and Marco Bibuli	CNR
3.	"Overview of research activities in Mobile & Marine Robotics Research Centre, University of Limerick"	22/01/2016	Prof. Daniel Toal and Dr. Edin Omerdić	CNR
4.	Invited talk "Towards Reproducible Robotics Research"	22/01/2016	Prof. Fabio Bonsignorio	*Scuola Superiore Sant'Anna,* IT
5.	"Heterogeneous Adaptive Maritime Mobile Expeditionary Robots"	23/05/2016	Dr. Vladimir Djapic	*SPAWAR,* USA
6.	"Bio-Hybrid Systems: Challenges and Potentials"	29/09/2016	Dr. Serge Kernbach	*Cybertronica*, GE

- **Participation in innovation management trainings**

	TITLE	DATE	NAME	LOCATION
1.	"Fundamentals of the intellectual property for the researchers"	04/03/2016	State Intellectual property office	UNIZG-FER
2.	Excellence in Horizon 2020 proposal writing and project implementation training	15-16/04/2016	European Training Academy	Opatija, HR
3.	Invited talk "University of Girona Project Management System – sharing experiences with LABUST laboratory"	09/06/2016	Joseta Roca, UdG	Skype (UNIZG-FER)
4.	"Patent: A tool to promote"	18/06/2016	CNR team	Genova, IT
5.	"First 5 Decisions When Founding a Startup"	20/09/2016	Martin Reents (CEO Hetras Gmbh)	UNIZG-FER

1.2.3. Work package 3: Broad networking events

- **EMRA workshops**
  - **1st EXCELLABUST workshop: EMRA'16**

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EMRA'16 - Workshop on EU-funded Marine Robotics and Applications was organized by Consiglio Nazionale delle Ricerche and Newcastle University's School of Electrical & Electronic Engineering *on* **14th and 15th June 2016 in Newcastle, UK**. This event brought together a diverse range of speakers, from ongoing FP7/H2020 projects, industry, end-users and stakeholders. The interdisciplinary event provided an excellent opportunity for networking and cross-fertilisation of ideas in marine robotics, enabling technologies and applications.

EMRA'16 in numbers:

- 10 EU projects presented
- 18 speakers from industry and academia
- mora than 100 participants

More info is available here and photos here.

- **BtS summer schools**
  "Breaking the Surface" summer schools are planned for October 2016.

- **Conference and industrial events attendance**

	EVENT	DATE	LOCATION	PARTICIPANTS
1.	'Robotics in Space, Underwater, Industry and the Law'	02/02/2016	Dublin, Ireland	UL
2.	European Robotics Forum - ERF 2016	21-23/03/2016	Ljubljana, Slovenia	UNIZG-FER
3.	Oceanology International 2016	15-17/03/2016	London, UK	UNIZG-FER, CNR, UdG, UL
4.	Marine Renewable Energy Ireland Symposium	5-6/05/2016	Galway, Ireland	UL
5.	Student Autonomous Underwater Vehicles Challenge Europe (SAUCE'16)	3-8/07/2016	La Spezia, Italy	UNIZG-FER
6.	Visit to central offices of SENER	21/07/2016	Spain	UdG
7.	Underwater Communications and Networking (UCOMMS'16)	30/08 – 01/09/2016	Lerici, Italy	UNIZG-FER
8.	10th IFAC Conference on Control Applications in Marine Systems (CAMS'16)	13-16/09/2016	Trondheim, Norway	UNIZG-FER, UL, UdG

1.2.4. Work package 4: Dissemination and outreach

- **General dissemination**

Project visual identity

EXCELLABUST visual identity was created at the beginning of the project and in accordance to the projects main objectives. Developed materials will lead to project's recognisability among scientific and general community.

Developed materials:

- Logotype

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EXCELLABUST

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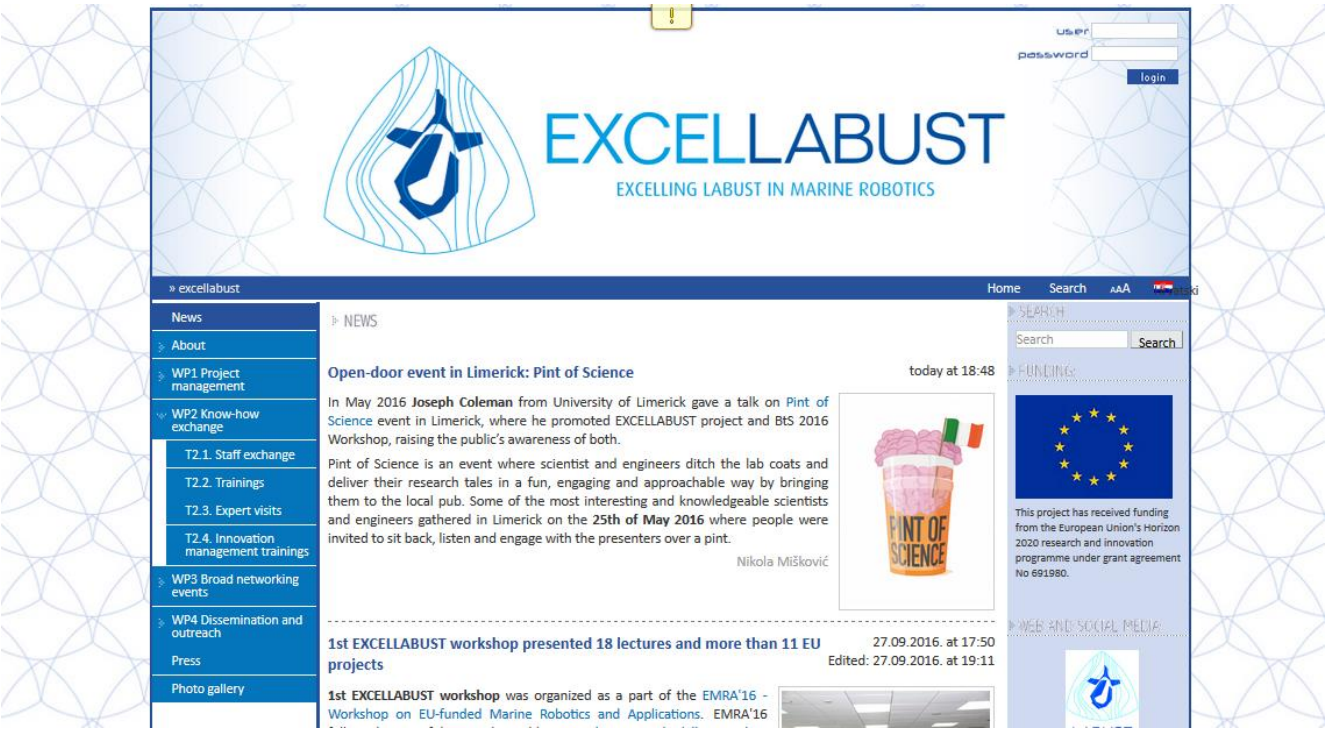
Web-site

EXCELLABUST (http://excellabust.fer.hr/) web-site was created at the beginning of the project and it is continuously updated with project news, information, deliverables, training materials, photos etc. by the members of the Consortium.



Social media accounts

Promotional materials – for EXCELLABUST trainings, lectures, events and visiting conferences, fairs and events

- Posters

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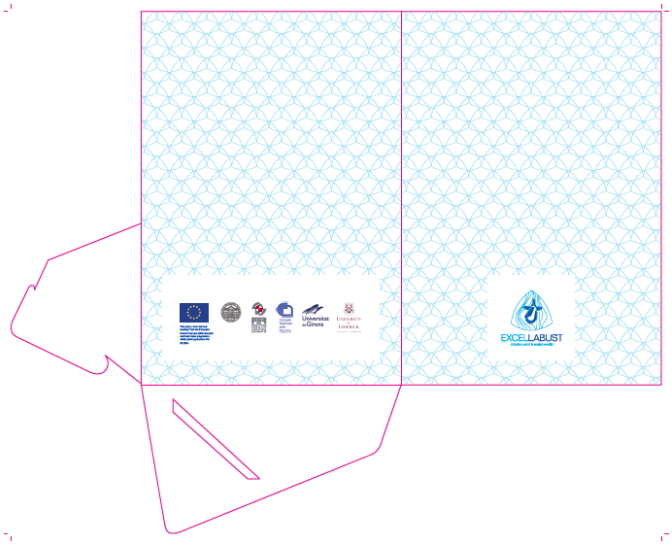
- Folders



- **EXCELLABUST soft-shell jackets for Consortium**

- **EXCELLABUST bags for training participants**

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- **"Open door" events – outreach to schools, pupils and teachers**

	EVENT	DATE	LOCATION
1.	Open-door event for elementary school students	03/02/2016	UNIZG-FER
2.	Open-door event during Job Fair	09-10/05/2016	UNIZG-FER
3.	Open-door event in Limerick: Pint of Science	25/05/2016	UL
4.	UdG organizes R2B2 workshops for pupils	03, 04, 05, 07/2016	UdG
5.	MaREI Open Days in June - Cork Harbour Festival	05/06/2016	UL

- **Database with key industrial and research stakeholders**

UL is developing a marine robotics database which will list the key industrial and research stakeholders, and will include a description of each stakeholder, their contact details, and keywords associated with them. A prototype of database has already been designed and will be used as a basis for discussion during the BtS 2016 workshop and similar events. The feedback received will be used to improve the prototype and to build the first version of the database by the end of the year.

Summary of deliverables

WP #	Del Rel. No	Del No	Title	Lead benef.	Submitted (date)
WP4	D1	D4.1	Website online	UNIZG-FER	02 Feb 2016
WP2	D2	D1.1	Statement on entering publication list to the Participant Portal	UNIZG-FER	25 Feb 2016
WP4	D3	D4.2	Dissemination plan - first version	UL	01 Apr 2016
WP3	D4	D3.1	Proceedings of EMRA workshop 1	CNR	14 Jul 2016
WP1	D5	D1.2	Nine-month project report 1	UNIZG-FER	30 Sep 2016
WP2	D9	D2.1	Nine-month report on the progress of know-how exchange 1	UdG	03 Oct 2016

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Summary of milestones

No	Name	Lead benef.	Delivery date	Achieved

Impact

The information in the DoA related to the project impact are still relevant and do not need updating.

Exploitation

The information in the DoA related to the project exploitation are still relevant and do not need updating.

2. UPDATE OF THE PLAN FOR EXPLOITATION AND DISSEMINATION OF RESULT

The first version of the dissemination plan has been produced by UL in the form of D4.2. The plan outlines the main objectives of the project and describes the internal and external communication methods defining tools and strategies to achieve them, including the basic mechanisms which will be adopted by project consortium and possible steps that should be taken for their realisation.
The plan represents the indispensable support to project partners in carrying on dissemination activities during the project lifetime and after. It is intended to ensure that relevant target groups and end users are informed about the project's outputs and that exploitation of the results is carried out in satisfactory and efficient way. The main activities include standard dissemination activities to raise awareness of the initiative among the key actors and specific target groups on different levels in the sector and a broader European level.

3. UPDATE OF THE DATA MANAGEMENT PLAN

Data management plan is not applicable for this project.

4. FOLLOW-UP OF RECOMMENDATIONS AND COMMENTS FROM PREVIOUS REVIEW(S)

Not applicable since there were no previous review meetings.

5. DEVIATIONS FROM ANNEX 1

Tasks

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All tasks are running according to the plan in the DoA.

Use of resources

5.2.1. Unforeseen subcontracting

There was no unforeseen subcontracting.

5.2.2. Unforeseen use of in kind contribution from third party against payment or free of charges

Insert text from here… There was no unforeseen use of in kind contribution from third party against payment or free of charges.

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