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Project No.: 825429 SocketSense

SOCKET:SENSE
A TAILORED FIT OF THE FUTURE

Advanced sensor-based design and development of wearable prosthetic socket for amputees

Start date of project: 2019-01-01 Duration: 48 months

Deliverable D7.8:

Plan for the Dissemination and Exploitation of Results – M48

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Executive Summary

Dissemination, communication and exploitation is an essential part of the SocketSense project. The goal of the project is to develop an innovative advanced sensor-based socket system and in order to reach as many patients as possible it is critical to have an effective dissemination strategy and to prepare the commercial uptake of the novel socket system.

This document presents the second version of the Plan for the Dissemination and Exploitation of Results (D7.8) and builds upon deliverable D7.7 (submitted in M26). The two sections which form this deliverable outline the Dissemination Plan and the Exploitation Plan of the SocketSense project.

Section A, the Dissemination Plan, defines the dissemination strategy of the project by describing the main objectives of the dissemination activities and the five-fold approach that was followed:

1. Elicitation of topics of dissemination
2. Identification of target audience
3. Selection and usage of the most appropriate methods and tools
4. Establishment of a well-managed dissemination task plan
5. Monitoring/evaluating the progress of the dissemination activities

Additionally it presents the target audience for the dissemination activities (Academic & research community, Industry, Standardization Bodies, Regulators, framework builders, and policy makers, EU Projects in similar domains, end users) and it presents the dissemination tools (project brand identity and a targeted set of or electronic and printable communication materials) and the dissemination channels (journals, conferences, workshops and other events) that will be used in order to reach the target audience. Moreover the dissemination plan outlines the responsibilities of the partners regarding the dissemination activities of the project and it presents the Key Performance Indicators (KPIs) that were used in order to understand the reach and sustainability of the project's results. Dissemination activities were performed during the whole project lifetime. The plan was flexible and allowed for adaption of the dissemination strategy as needed, taking into account both short and long term activities.

Section B, the Exploitation Plan, provides an overview on the exploitation methodology, project results identified to the end of the funded period of the project (M48), the owners of results, the sectors of potential applications and use and what type of exploitation is foreseen after the project's end for each result. This section also contains details on how IP was managed as well as the initial exploitation plans of partners, their interest and the opportunities partners expect from exploiting the results. Additionally it examines the risks and potential obstacles for exploitation in six categories (Technological, partnership, market, IPR/Legal, Financial, Health and Safety/Environmental risks) and it analyses how to address them.

1. Introduction

1.1 SocketSense Project in a nutshell – objectives and expected impact

SocketSense is an EU funded project aiming to develop an innovative advanced sensor-based socket system that will enable comfortable socket manufacturing, tailored to patients' needs. Specifically, we used runtime monitoring of residual limb tissues evolvement by collecting data through advanced sensors embedded into the socket.

With SocketSense, prosthetists will be able to achieve a good-fit socket within the same day, when the patient needs a new one, compared to current practices that require a lot of trial and error and takes too much time. Moreover, this technique will apply to all lower limb amputees (above knee and below knee).

Technical Objectives:

1. To design, develop and manufacture innovative multi-touch and multi-functional quantum technology based super sensors (QTSS™) - a patented technology developed by LussTech (project partner in SocketSense) - to be embedded in the prosthetic socket for the patients to wear in everyday life.
2. To develop advanced biomechanical algorithms for the analyses of residual tissues and dynamic sensor data to enable the design and manufacture of prosthetic socket optimized for comfort.
3. To develop data communication strategy for data collection, transmission, analysis and for the output to be accessed automatically by the prosthetic clinics in order to reduce lead time further.
4. To develop a unified software system for prosthetic clinics.
5. To carry out preliminary clinical trials to validate the whole system.

Commercial Objectives:

1. To develop an exploitation and business plan for successful implementation and market transfer of the innovative SocketSense system (by month 48).
2. Dissemination of the project outcome to at least 4 international events before month 30, and dissemination/awareness campaign and knowledge transfer events (at least 6 events) for medical and healthcare stakeholders from the second year of the project till the end.
3. Compliance and Implementation of governing medical certifications, regulations and standards prior to commercialization and market uptake (by month 48).
4. To be in compliance with relevant standards, regulations and certification for SocketSense system.

The foreseen impact of the project can be summarized in the following 6 points:

- IMPACT 1 - Technology leaps related to improved performance (functionalities, autonomy, reliability, manufacturability and cost…) and contributing to European leadership in large area, flexible and wearable electronics
- IMPACT 2 - The emergence of new products based on the combination of printed and large area processed electronics
- IMPACT 3 - Increased R&D cooperation in technology device development and related manufacturing processes
- IMPACT 4 - Developing further manufacturing capabilities in Europe
- IMPACT 5 - Creating new opportunities for digitisation in other sectors and including new actors in the ecosystems (designers, artists…)
- IMPACT 6 – Increased industrial investments in flexible and wearable electronics

The goals of the project are achieved through the seamless collaboration of the project partners:

2. Section A: DISSEMINATION PLAN

2.1 Dissemination Strategy

The main focus of the dissemination strategy was to identify and consolidate the activities to be implemented, for maximizing the impact of the project and for promoting commercial and other exploitation of the project results.

The main objectives of the dissemination activities are:

1. **To raise public awareness** about the project, its expected results and progress and the novel sensor-based socket system, within defined target groups using effective communication means and tools.
2. **To exchange knowledge**, best practices, and experience in general with projects and groups working in related fields (medical devices, advanced sensors and materials, prosthetics etc.) in order to join efforts, minimize duplication and maximize potential.
3. **To disseminate the fundamental knowledge**, methodologies and technologies developed during the project.
4. To pave the way for a successful commercial and non-commercial exploitation of the project outcomes related to the innovative socket system.

The dissemination activities were to:

- ensure easy access to information and results for all stakeholders,
- ensure engagement with all stakeholders and provide collaboration tools,
- reinforce links among the SocketSense project and other relevant projects and networks,
- involve the groups targeting the challenges addressed by SocketSense through key events,
- provide and disseminate relevant documentation and information about the project through specific channels.

Our dissemination strategy was based on the following five 5 pillars:

1. Elicitation of topics of dissemination (**what will be disseminated**)
2. Identification of target audience (**who will benefit most** from the project results and **who would be interested** in learning about the project findings)
3. Selection and usage of the most appropriate methods and tools (**what is the most effective way to reach the target audience**)
4. Establishment of a well-managed dissemination task plan (**when dissemination will take place**)
5. Monitoring/evaluating the progress of the dissemination activities (**what is the impact of the dissemination activities**)

In order to achieve the overall vision and goals of the project for maximum impact, we followed **a threefold approach**, consisting of making results and knowledge available (dissemination), promoting research results and the project in general (communication) and engaging stakeholders (collaboration and engagement).

We progressively increased communication and dissemination activities as results progressed over the lifetime of SocketSense, ranging from the creation of the project's identity, to the creation of constructive conditions for wider engagement, and to the establishment of long- term sustainability mechanisms towards the end of the project. The process is illustrated in Figure 1.

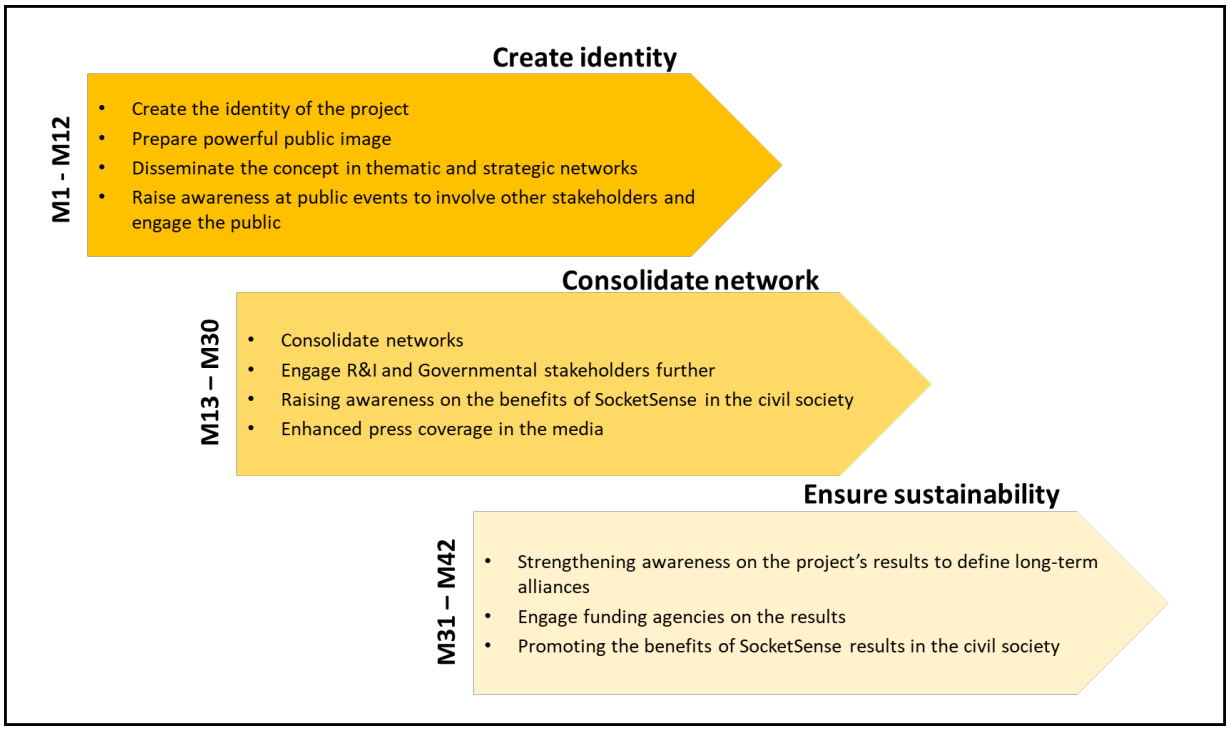


Figure 1: Approach of dissemination strategy

In the following table we categorize the activities related to WP7 in relation to the contents of the above illustrated strategy.

Table 1 Dissemination activities (per phase)

Phase 1	**Main Scope: CREATE IDENTITY**
Approach	**Activities**
Create the identity of the project	• Drawing of Strategy and plan of Communication and Dissemination [M6] • Connect Project with Social Media [M4] o LinkedIn Group • Website is online [M4] (www.socketsense.eu) • Identification and update of external webpages
Prepare powerful public image	• Connect Project with Social Media [M4] • Preparation of Brochure, and Project Communication material (Templates, logo, presentations) [M6] - **D7.1**
Disseminate the concept in thematic and strategic networks	• European stakeholders, as well as relevant journals, magazines and Horizon 2020 projects/calls (for further cooperation), have been identified. • Appropriate communication and advertising channels have been identified. • Open access publication guidelines have been created (including a list of targeted journals and conferences). • An open access and open research data pilot questionnaire has been created and sent out, and answers to the questionnaire have been gathered and analysed. • Release of 1st Newsletter [M6]

Raise awareness at public events to involve other stakeholders and engage the public	• Participation in targeted events (a list with the events where members of the SocketSense consortium participated or plan to participate can be found in Table 9) • Organising a specialist workshop [M6]: a visit at the Rehabilitation Centre of South Tees Hospitals was organised, where the partners discussed with prosthetists and a patient.
Phase 2	**Main Scope: CONSOLIDATE NETWORK**
Approach	**Activities**
Consolidate networks	• Continually updating the list of identified stakeholders • Participation in targeted events • Organisation of workshops, meetings and discussions with stakeholders • Providing information about the project through regular updates of the project website
Engage R&I and governmental stakeholders further	• Organisation of specialist workshops: – in the Virgen del Rocío University Hospital (Seville) a workshop was organised with patients, amputee associations, prosthetists and research personnel [M14] – a virtual workshop for the exchange of experiences was arranged with an occupational therapist [M24] • Participation in relevant events • Conference publications, poster presentation • Launch of 3 project courses for Master students • Engaging with regulatory bodies: – attending a Full Committee Meeting to review ethics application with the Health Research Authority (UK) for Task 4.3 [M23] – T4.3 trial has been notified to the National Institute for Health Research (NIHR) via the Central Portfolio Management System (CPMS) (UK), the online database used for the management of all study records within the NIHR Clinical Research Network (CRN) Portfolio – Communication with MHRA (UK) regarding approval for the T6.1 clinical trial [M6-M11; M20-M26]
Raising awareness on the benefits of SocketSense in the civil society	• Organisation of a specialist workshop [M14] • Release of Newsletters [M12, M18, M24, M30, M36, M42, M48] • Regular update of project website • Master Thesis presentation [M24]
Enhances press coverage in the media	• Publication of articles • Publication of White Paper [M23]

2.2 Targeted audience

The dissemination activities of SocketSense were customized in order to reach the target audience more effectively and to utilize the available channels and tools as efficiently as possible. In order to achieve this SocketSense dissemination strategy was divided into two segments, the internal and external, which are presented below.

2.2.1 Internal Communication

As described in the following sections, we used different tools in order to develop an effective internal communication strategy. This strategy helped to ensure a constant and effective exchange of information between the partners as well as an efficient and coordinated management of the project. The overall aim was to keep all the partners informed on project developments, progress of achievements, and/or accomplishment of objectives.

Table 2 Internal Communication Plan

WHO	WHAT	WHY	HOW
SocketSense Partners	• Be aware of the common goals of communication and dissemination and commit to them • Plan, share and coordinate activities proactively • Follow the internal procedures	• To support them in consolidating partnership and network creation • To facilitate project management • To coordinate common activities	• Shared workspace, online and physical meetings, mailing, website • Presentations, emails, phone calls, deliverables, newsletters
EC Project Officer	• Ensure visibility of project and its results • Highlight the impact of communication and dissemination	• To support bi-lateral communication between Project Officer and Project Coordinator	• Central milestones and results • Annual reports • Project reviews
Partner Organizations	• Ensure a long lasting impact of outcomes	• To engage them in building collaboration • To integrate their perspectives in the definition of research and innovation areas of joint interest, to inform them on IP requirements • To raise awareness of the benefits	• Internal meetings, internal website, impact assessment, presentations, information material, newsletters

2.2.2 External Communication

External communication activities are targeting the stakeholders outside SocketSense to achieve the following objectives:

- To facilitate the sharing of project results and outcomes, activities, project events, and other project information
- To invite relevant industrial, academia and clinical stakeholders to interact with SocketSense as external sources of information and discussion players
- To further engage them in dissemination events (e.g. raising awareness events, brokerages, roundtables)

In order to direct our dissemination activities more efficiently and to be able to maximize the impact of this project, we identified: 1. the audience that is interested in the efforts of the consortium and the scientific results of the project; as well as 2. the audience that can play an important role in the exploitation of those results. Additionally, we further identified the stakeholders who can have a direct effect on our effort to develop the envisioned socket system. The target audience and their motivation to learn about the project and the reasons to get them involved in the project are summarized in the table below:

Table 3 Categories of Targeted audience of SocketSense Project

Types of Audience	Description	Motivation
Academic & research community	This group includes research communities working on prosthetics as well as on the scientific and technological areas related to the overall framework of the project. Scientific contributions of SocketSense are particularly interesting for researchers working in the fields of wearable technology, AI, biomechanics, edge-computing, etc.	• Become aware of the results and innovation generated by SocketSense that can benefit their own research. • Stay up to date with the state of the art in the area of prosthetics.
Industry	SocketSense is of close relevance to organizations active in the healthcare and medical devices industry but also in different industry sectors like flexible sensors, medical IoT, smart data analytics and clinical tools, etc. This group includes companies (large corporations, SMEs and startups) that are developing integrated solutions in the area of prosthetics or technologies relevant to this field.	• Industrial players want to stay up to date with the state of the art in the area of prosthetics or in areas like AI, sensor technologies, data analysis etc. • Create connections with industrial players that can play a part in the exploitation of the results of the project. • Receive critical input that might affect the design of the socket system.
Standardization Bodies	This group includes Standardization Bodies that develop the technical standards related to the needs of amputees.	• Standardization Bodies can provide consultative advice on pre-standardization procedures (when the technology reaches a suitable TRL).
Regulators, framework builders, and policy makers	This is a wide group encompassing authorities, representatives and associations, Ministries, and Public Administrations at national and international level.	• Receive critical input regarding the regulatory compliance of the socket system.

Types of Audience	Description	Motivation
		• Inform them about the results of the project and give critical input for future regulations and policies
EU Projects in similar domains	This group includes EU projects in the area of prosthetics, AI, sensors, data analysis and more.	• Avoid overlaps in scientific research • Identify joint activities that will increase the impact of the projects
End users	This group includes Hospitals, Rehabilitation centres and Orthopaedic Prosthetics Clinics and amputees	• Validate our assumptions regarding the design of the novel socket system • Inform end users about the innovations of the socket system developed in the framework of the project and how it can improve the quality of life for amputees

The main aim was to maximise the involvement of the targeted audiences in order to let them closely follow SocketSense developments, gather their feedback and engage them into the SocketSense activities.

As explained in Section 2.1 Dissemination Strategy, our dissemination and communication activities was carried out in three phases; the involvement and engagement of stakeholders followed this approach.

In Year 1 (Month 1- Month 12), where no solid results were available, dissemination efforts were mainly geared towards maximising the project's visibility among the stakeholders. Providing information about the project concept, expected results and benefits will make sure that the project is known by relevant stakeholders, scientific community and end users.

The dissemination tools that were primarily used in the first year include project website, social media, promotional material (poster, flyer), presentations & attendance in conferences and workshops related to prosthetics, medical devices, wearable technology, AI, biomechanics, sensor technologies.

During the second phase of the project (Month 13 – Month 30), scientific & technological findings and initial project results were disseminated. In this phase, stakeholders will be more engaged. Therefore, dissemination was more focused and targeted, through discussions, meetings, consultation, social media posts, press releases, newsletters, publications and participation in relevant conferences and exhibitions.

It was of utmost importance to gather the feedback and insights of stakeholders, to help validate early and overall project results and to improve the work done in the project. Therefore, SocketSense organised specialist workshops, targeting medical and healthcare professionals both from the scientific and industrial community.

In the last phase of the project (Month 31 – Month 48), the main focus was to disseminate more advanced project results, strengthen awareness on the SocketSense results and to facilitate the exploitation of results. The dissemination activities were also aimed at attracting potential users for the SocketSense technology and promoting the benefits of SocketSense results in the civil society. Accordingly, results were published in related scientific journals, conferences, workshops, exhibitions and trade fairs.

A specialist and exploitation workshop has been planned for demonstration of project results to interested stakeholders and end users (hospitals, rehabilitation centres, O&P clinics and patients), to discuss future work and to assess the sustainability of the project results. SocketSense participated in an international workshop to serve both as an important promotional tool for the SocketSense achievements and results.

The table below summarises the contact and engagement with the identified stakeholders.

Table 4 Stakeholder engagement matrix

Type of communication	Objective	Type of targeted stakeholder	Timeline
Website	Major hub for dissemination Results presentations Communication of project news & events	All stakeholders	Constantly Updates every 2-3 months
Social media – LinkedIn group	Awareness creation Establish two-way communication with the targeted audience	All stakeholders	Updates based on project developments
Dissemination toolkit (flyer, poster, presentation)	Awareness raising, creating the visual identity, message diffusion	All stakeholders	Distributed continuously at conferences and project workshops
Newsletter	Regular updates on project progress, activities and publications Made available on the project website, sent out to registered stakeholders	All stakeholders, especially project targeted stakeholders	Periodically Month 6, Month 12, Month 18, Month 24, Month 30, Month 36, Month 42, Month 48
Conferences, workshops and exhibitions participation	Awareness creation Networking and collaboration with relevant stakeholders and other projects Engagement of user groups, as well as wider academic and industrial community Methodology presentation/ validation Disclose SocketSense results to support the exploitation of results	Communities of users and experts, core community of SocketSense ecosystem, academic & research community, other EU projects, general public	Continuously, as per the identified events in Table 9
Scientific papers and publications	To share the research results with the scientific community Knowledge diffusion to the scientific community	Research / Academia	As appropriate, based on project phases and results
Press and news release, articles	Awareness creation Communicating significant project developments, milestones, important news and announcements about the project	All interested stakeholders	Periodically based on the project developments and results

Type of communication	Objective	Type of targeted stakeholder	Timeline
Project Specialist Workshops organisation	Consultation, brainstorming, discussion and validation of SocketSense results and achievements with SocketSense stakeholders (scientists, medical professionals, healthcare, regulators)	Relevant scientific and industrial community	Month 6 Month 14 Month 24 Month 27 Month 30-36
Project Exploitation Workshop organisation	To discuss and disclose SocketSense results to support the uptake of results among the project partners as well as with external stakeholders Knowledge transfer	Communities of users, medical and healthcare stakeholders	Month 30 Month 36 Month 42 Month 48
Clustering activities and liaising with R&D projects with similar topics	Effective information exchange between related projects, disseminate best practice Alignment of activities among the relevant projects	EC, national and other relevant projects	Continuously, as appropriate (possibly in conjunction with SocketSense workshops)
Event toolkit (flyer, poster)	Awareness creation and message diffusion	All stakeholders	Distributed at events
White papers	Results presentation Information and knowledge diffusion Communicate the benefits of SocketSense	Communities of users and experts, core community of SocketSense ecosystem	M23, M36, M42

Table 5 displays some important stakeholders that were identified by the project partners and the communication tools used. These stakeholders were targeted over the duration of the project in order to secure their involvement.

Table 5 Important Stakeholders for the SocketSense project

Name of organization	**Type of stakeholder**	**Type of communication**	**Website**
Academic Health Science Network	Ecosystem / Community / Network Public Body	SocketSense newsletter, press releases, invitation to SocketSense international workshop, results of project briefing (end of project / by the end of trials)	Link
NIHR Clinical Research Network (National	Ecosystem / Community / Network	SocketSense newsletter, invitation to SocketSense specialist workshops, consulting	Link

Name of organization	Type of stakeholder	Type of communication	Website
Institute for Health Research)	Public Body / Regulatory Body	with them around the project, results of project briefing	
National Institute and Health and Care Excellence	Ecosystem / Community / Network Public Body	SocketSense newsletter, invitation to specialist workshops, results of project briefing	Link
NHS England	Policy Maker Public Body	SocketSense newsletter, invitation to specialist workshops, results of project Briefing	Link
SAMFYRE	Conference, Ecosystem / Community / Network	SocketSense newsletter, Invitation to SocketSense specialist workshops	Link
SERMEF	Conference, Ecosystem / Community / Network	SocketSense newsletter, Invitation to specialist workshops	Link
AEF	Conference, Ecosystem / Community / Network	SocketSense newsletter, Invitation to specialist workshops	Link
SEIS	Conference, Ecosystem / Community / Network	SocketSense Newsletter, Invitation to specialist workshops	Link
Roessingh Research and Development	Research / Academia	SocketSense Newsletter, Invitation to international workshop	Link
University of Strathclyde	Research / Academia	SocketSense Newsletter, invitation to international workshop	Link
National Institute for Health Research (NIHR) – North East and North Cumbria	Public Body	SocketSense Newsletter, Invitation to specialist workshops	Link
NIHR Office for Clinical Research Infrastructure (NOCRI)	Public Body	SocketSense Newsletter, Invitation to specialist workshops	Link
Vascular Society of Great Britain and Northern Ireland	Public Body	SocketSense Newsletter, invitation to specialist	Link

Name of organization	Type of stakeholder	Type of communication	Website
		workshops, results of project briefing	
GKV-Spitzenverband	Policy Maker	Invitation to SocketSense specialist workshops	Link
Ottobock	Strategic Industry, Research / Academia	SocketSense Newsletter, Invitation to specialist workshops, invitation to exploitation workshops	Link
Aqualeg	Strategic Industry	SocketSense Newsletter, Invitation to SocketSense specialist workshops, invitation to exploitation workshops	Link
Sensor City	Ecosystem / Community / Network	Towards end of project - disseminate project outcomes by getting in contact with them directly and providing details of project outcomes	Link
CENSIS	Ecosystem / Community / Network	Towards end of project will disseminate project outcomes by getting in touch with them directly and providing details of project outcomes.	Link
OA-E (Organic & Printed Electronics Association)	Ecosystem / Community / Network	Towards end of project will disseminate project outcomes by getting in touch with them directly and providing details of project outcomes.	Link
SENSARS Neuroprosthetics	Strategic Industry	Consultation (interview) on the applicability of the solution to the use case of nerve stimulation restoring lost extremities	Link
Ottobock SE & Co. KGaA	Strategic Industry	Zoom call, interview on daily operations, invitation to exploitation workshops	Link
Rechtsanwaltskanzlei Müller & Paul	Strategic Industry	Interview on statuary insurance coverage of prosthetics, invitation to exploitation workshops	Link

Name of organization	Type of stakeholder	Type of communication	Website
Alt-bionics	Strategic Industry	Interview on technological development. Market entry in US. Invitation to exploitation workshops	Link
GAIA Technologies LLC	Strategic Industry	Non-profit charity organization which makes prosthetics. Interview on the use of technologies, invitation to exploitation workshops	-
GoSafe	Ecosystem / Community / Network (H2020 project)	invitation to international workshop, exchange of information about projects	Link
MyLeg	Ecosystem / Community / Network (H2020 project)	invitation to international workshop, exchange of information about projects	Link
Eurobench	Ecosystem / Community / Network (H2020 project)	invitation to international workshop, exchange of information about projects	Link
University of Heidelberg, Department of Orthopedics and Traumatology	Research / Academia	Visit/discussion in M12, newsletter, invitation to specialist workshops, invitation to international workshop	Link
SINTEC	Ecosystem / Community / Network (H2020 project)	Discussion in M10, newsletter, meeting in RP2, invitation to specialist workshops, invitation to international workshop, exchange of information about projects	Link
ICES (Competence network of KTH on embedded systems)	Ecosystem / Community / Network (has 30+ industry members in Sweden, such as Ericsson, Electrolux, SAAB, Atlas Copco)	Regular meetings, invitation to specialist workshops	Link
MHRA (Medicines and Healthcare Products Regulatory Agency)	Public body / Regulatory body	Email communications	Link
Health Research Authority	Public body / Regulatory body	Full Committee Meeting (M23)	Link

3. Dissemination and communication tools and channels

A combination of traditional and online communication tools was used by SocketSense to reach a wide audience. The project website and social media channels are part of the online tools, whereas the traditional channels cover events, paper presentations, press interviews, TV and radio appearances as well as visits, workshops and meetings. Specific tools are suitable for information sharing while others invite the visitor to engage. In the following sections we present the channels for the external and internal communication.

3.1 Visual identity - logo

The design of the logo (Figure 2) was concluded according to the project work plan in M3. It includes the name of the project together with the phrase "A tailored fit for the future" which summarizes the concept of the project for the development of an innovative advanced sensor-based socket system.

SOCKET:SENSE
A TAILORED FIT OF THE FUTURE

Figure 2: SocketSense Project logo

3.2 Project Flyer, poster and website

In the framework of D7.1 Dissemination Toolkit the SocketSense partners prepared the specifications of a series of dissemination tools including the Project Flyer, the Project Poster and the Project website.

These tools helped the consortium partners to reach a wide audience and to communicate in an effective way the results of the project. More details regarding these tools can be found in D7.1.

3.3 Newsletters

The project's progress was communicated to the key stakeholders via digital newsletters that was issued regularly (every six months) and which was also available on the project website. The content presented in the newsletters included:

- News related to the activities of the project (e.g. launch, meetings, participation/ organization of events and workshops);
- Announcements regarding the progress of the project;
- Publications from project partners related to the project.

Examples of published newsletters are given below:

Newsletter #1 (13/7/2019) - Link
Main contents:

- an introductory message from the coordinator of the project (*DeJiu Chen – Project Coordinator & Associate Professor, KTH*), with information about the project

- a synopsis of the objectives of each work package of the project

Newsletter #2 (19/2/2020) - Link
Main contents:
- an overview of the technical tasks and progress in the first year of the project
- an article "Sensors improve life for amputees", introducing the work of KTH in the SocketSense project
- an article about Quantum Technology Supersensors™ (QTSS)

Newsletter #3 (2/7/2020) - Link
Main contents:
- an overview of the project's technological advances in the first half of 2020
- description of the impact of COVID-19 on the SocketSense project implementation
- introduction to the work of the clinical partner South Tees Hospitals NHS Foundation Trust in the SocketSense project

Newsletter #4 (26/2/2021) - Link
Main contents:
- highlight of "recent" progress regarding the sensor optimization, biomechanical simulation and dynamic testing
- SocketSense Whitepaper on Advanced Sensors
- work progress of TWI Hellas on AI tools for improving prosthetic socket comfort

3.4 Social media

SocketSense social media channels and tools were activated in M4 for creating the "virtual identity" of the project (LinkedIn group). The social media dissemination tools helped us to reach a wide audience, but also helped to establish two-way communication channels with our target audience. This aspect is particularly important in this specific project because it gave valuable feedback for the design of the innovative socket from potential end users. Regular media monitoring was activated to evaluate how the project was perceived by users and followers.

LinkedIn group

A project LinkedIn group (SocketSense H2020 Project) was created in M4. Participation in the group was not limited to project members. This group offered a hub for stakeholders who are interested in the results of the project and included amputees, doctors, companies and scientists active in the domain of medical devices and prosthetics as well as scientists and companies which are active in wearable technology, AI, sensors, data-driven design, secure communication, where they can share content, post questions regarding the novel socket system and the technologies that have been developed under the project.

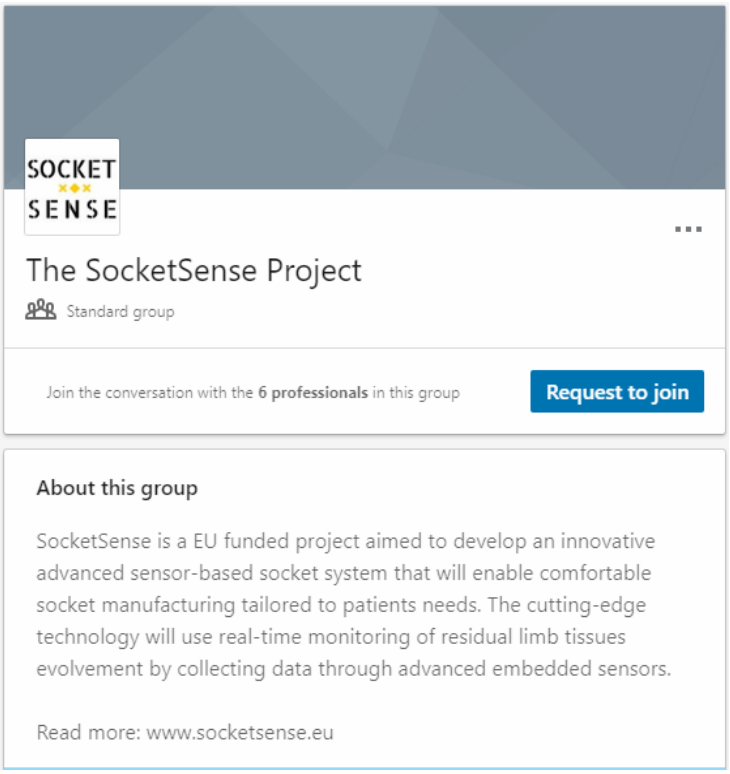


Figure 3: SocketSense Linkedin Group

KTH coordinates the SocketSense Linkedin group activities, but content is created by all partners.

Posts in RP1 were on a number of topics, i.e.:

- Developments relating to the SocketSense project
- News items relevant to the project scope (prosthetics, novel sensors) and its target groups (industrial players in the medical devices and the prosthetics industry, end users, doctors etc.)
- Events related to the project

3.5 Dissemination templates

To ensure that all documents produced by the project, have the same design and consistency with the project's image for the entire project's duration, project templates were developed in M3. These templates can be found in D7.1 Dissemination Toolkit.

3.6 Audiovisual material

An effective way to communicate the project and disseminate its results are the SocketSense videos that can be displayed during events, but also shared on the web.

3.7 Project meetings

Project meetings will be scheduled and held periodically with dates communicated well in advance to partners.

3.8 Document sharing

In order to share project documentation, both in a restricted and public access section, partners used the online platform Box for:

- Files exchange with size unsuitable for email attachments
- Sharing files with other web-communities
- Using a list of files external to the media library
- Using a list of archived files, such as videos, PDF, or audio files

3.9 Dissemination Activities

All the partners of the SocketSense project used the dissemination tools that were at their disposal for more effective engagement with the identified target audience of the project. As we can see in table 6 the available dissemination tools can reach almost all of the target audience, ensuring appropriate exposure of the projects' results.

Table 6 SocketSense Dissemination Tools & Target audience

Dissemination tools	Target audience					
	Academic & research community	Industry	Standardization Bodies	Regulators, framework builders, and policy makers	EU Projects in similar domains	End users
Project website	✓	✓	✓	✓	✓	✓
Newsletters	✓	✓	✓	✓	✓	✓
Scientific Publications	✓	✓	✓	✓	✓	-

Project marketing material (flyers, posters, audiovisual material)	✓	✓	✓	✓	✓	✓
Participation in events (national and international conferences. Exhibitions, workshops etc.)	✓	✓	✓	✓	✓	-
Social media	✓	✓	✓	✓	✓	✓

3.9.1 Publications

The goal was to ensure that the scientific and technological results of the project were appropriately disseminated in the scientific communities and among industrial players that are involved in the development of prosthetics, as well as in the development of cutting edge technologies in fields like biomechanical modelling or advanced materials and sensors. Different SocketSense partners either individually or in collaboration developed and publish the results in conference papers, journals, as well as in magazines.

Publishing and presenting papers in relevant events is a very effective way to attract the interest of important stakeholders. This constitutes a basis for revealing shared topics and identifying potential collaboration opportunities. The publications from the project partners were also published on the SocketSense website. Table 7 displays the identified journals relevant to the project and its communication strategy.

Table 7 SocketSense Targeted Journals and magazines

Name	Relevant Info	Link
Artificial Intelligence for Engineering Design, Analysis and Manufacturing (Open access)	This journal publishes articles about significant AI theory and applications based on research in all branches and phases of engineering. Suitable topics include: analysis and evaluation; selection; configuration and design; manufacturing and assembly; and concurrent engineering.	Link
ASME Journal of Medical Devices	The Journal of Medical Devices presents papers on medical devices that improve diagnostic, interventional and therapeutic treatments focusing on applied research and the development of new medical devices or instrumentation.	Link
British Journal of Surgery (Open access)	This journal publishes articles that aim to advance and improve education in surgery and to diffuse knowledge on new and improved methods of teaching and practising surgery in all its branches.	Link
Computer Methods in Applied Mechanics and Engineering (Elsevier) (Open access)	This journal publishes articles related to any type of computational method for the simulation of complex physical problems leading to the analysis and design of engineering products and systems.	Link
IEEE Access (open access)	IEEE Access is an open access multidisciplinary, electronic archival journal that presents the results of original research or development across different fields.	Link
IEEE Embedded Systems Letter	The IEEE Embedded Systems Letters focuses on the latest technical advances in embedded systems and related areas in embedded software.	Link
IEEE Journal of Biomedical and Health Informatics	J-BHI publishes papers related to recent advances in the field of biomedical and health informatics where information and communication technologies intersect with health, healthcare, life sciences and biomedicine.	Link
IEEE Robotics and automation (Open access)	IEEE Robotics and Automation Magazine publishes advances in theory and experiment related to the science of robotics and automation focusing on working systems and emphasizing creative solutions to real-world problems and highlighting implementation details.	Link
IEEE Transactions on Biomedical Engineering	IEEE Transactions on Biomedical Engineering contains basic and applied papers dealing with biomedical engineering.	Link
IEEE Transactions on Mechatronics (open access)	IEEE/ASME Transactions on Mechatronics journal focuses on practical aspects of the theory and methods of mechatronics, the synergetic integration of mechanical engineering with electronic and intelligent computer control in the design and manufacture of industrial products and processes.	Link

Journal of Biomechanics	The Journal of Biomechanics publishes articles with findings using the principles of mechanics to explore biological problems.	Link
Journal of Medical Devices	The Journal of Medical Devices presents papers on medical devices that improve diagnostic, interventional and therapeutic treatments focusing on applied research and the development of new medical devices or instrumentation.	Link
Journal of Orthopaedic Research	The Journal of Orthopaedic Research publishes articled within the full spectrum of orthopaedic research, including life sciences, engineering, translational, and clinical studies.	Link
Journal of Orthotics & Prosthetics	Journal of Prosthetics and Orthotics provides information on new devices, fitting and fabrication techniques, and patient management experiences, focusing on orthopaedic research, occupational therapy, physical therapy, orthopaedic surgery, amputation surgery, physical medicine, biomedical engineering, psychology, ethics, and gait analysis.	Link
Journal of the Mechanical Behavior of Biomedical Materials	The Journal of the Mechanical Behavior of Biomedical Materials is concerned with the mechanical deformation, damage and failure under applied forces, of biological material (at the tissue, cellular and molecular levels) and of biomaterials.	Link
Journal of Vascular Surgery (Open access)	Journal of Vascular Surgery focuses on articles that present scientific results which aim to improve the management of patients with vascular diseases.	Link
MDPI Electronics (open access)	Electronics (ISSN 2079-9292) is an international, peer-reviewed, open access journal on the science of electronics and its applications.	Link
Med-Tech Innovation Magazine	Med-Tech Innovation News magazine provides intelligence for professionals involved in the design and production of Class I,II & III medical devices and connects designers, manufacturers, buyers and early adopters across the medical engineering and manufacturing community with the latest innovations in technology, materials, processes, digital health and R&D	Link
Physiotherapy (Elsevier) (Open access)	Physiotherapy is dedicated to the advancement of physiotherapy through publication of research and scholarly work concerned with, but not limited to, its scientific basis and clinical application, education of practitioners, management of services and policy.	Link
PLOS ONE (open access)	This journal publishes interdisciplinary research across science, engineering, medicine and related social sciences and humanities.	Link
Printed Electronics World – IDTechEx	Printed Electronics World focuses on printed electronics in different forms (transistor circuits to power, sensors, displays, materials and manufacturing.	Link

Prosthetics and Orthotics International (IF:1.48) (open access)	This is a multidisciplinary journal focusing on medical, clinical, rehabilitation, technical, educational and research aspects of prosthetics, orthotics and rehabilitation engineering.	Link
Rehabilitation (Georg Thieme Verlag) (Open access)	-	Link
Sensors (MDPI) (open access)	This journal focuses on the science and technology of sensors and biosensors.	Link
The European Journal of Vascular and Endovascular Surgery (Open access)	This journal focuses on surgeons dealing with patients with arterial, venous and lymphatic diseases.	Link
Ultrasound in Medicine & Biology (IF:2.2)	This is the official journal of the World Federation of Ultrasound in Medicine and biology. It publishes articles that contributions that demonstrate a novel application of an existing ultrasound technology in clinical diagnostic, interventional and therapeutic applications, new and improved clinical techniques, the physics, engineering and technology of ultrasound in medicine and biology, and the interactions between ultrasound and biological systems, including bioeffects.	Link
Wearables Technology Insights – IDTechEx	This journal covers the latest wearables research and industry news, from enabling materials to the gadgets.	Link

Table 8 shows a selection of scientific publications of the SocketSense partners in technical papers, conferences, journals and magazines as well as publications in print media that have arisen from the SocketSense project. Scientific publications will continue to arise beyond the funded period of the SocketSense project.

Table 8 SocketSense Publications

Main Author	Contributors	Status	Title	Name of journal or magazine	Date of publication	DOI	URL
Noelia Marquez (Newspaper Diario de Sevilla)	SAS	Published (article)	Amputados: Expertos sevillanos diseñan un sistema para recuperar la movilidad	Newspaper Diario de Sevilla	2019/ 02/03	-	Link
Amalia F.L (ABC)	SAS	Published (article)	Piernas «inteligentes» que mejoran la movilidad	Newspaper ABC	2019/ 02/03	-	Link
Sevilla Actualidad	SAS	Published (article)	Especialistas del Virgen del Rocío desarrollarán prótesis inteligentes para miembros inferiores	Newspaper Sevilla Actualidad	2019/ 02/03	-	Link
Sevilla buenas noticias	SAS	Published (article)	Especialistas del Virgen del Rocío trabajan en diseño en un encaje protésico inteligente	Sevilla buenas noticias	2019/02/ 03	-	Link
KTH		Published (article)	Sensors improve life for amputees	KTH ITM News	2020/01/ 15		Link
KTH		Published (article)	Degree project contributes to amputees' quality of life	KTH News	2020/11/ 25		Link
KTH		Published	Master Thesis: Wearable sensors in prosthetic socket	Diva Portal	2019		Link
KTH		Published	Master Thesis: Effective Optimization of Deployment for Wearable Sensors in Transfemoral Prosthesis	Diva Portal	2020		Link

Main Author	Contributors	Status	Title	Name of journal or magazine	Date of publication	DOI	URL
Össur	KTH/TU	Published	A scoping review of pressure measurements in prosthetic sockets of transfemoral amputees during ambulation: key considerations for sensor design	MDPI Sensors Journal			Link
LussTech	IVF	Published	Development of Prototype Low Cost QTSS™ Wearable Flexible more Enviro-friendly Pressure, Shear and Friction sensors for dynamic Prosthetic Fit Monitoring	MDPI Sensors Journal	10.3390/s21113764		Link
TWI	KTH	Published	A Sensor-based Decision Support System for Transfemoral Socket Rectification	MDPI Sensors Journal	10.3390/s21113743		Link
TU	Ossur, KTH	Published	A scoping review of pressure measurements in prosthetic sockets of transfemoral amputees during ambulation: key considerations for socket fitting	Journal of Prosthetics and Orthotics (JPO)	10.3390/s21155016		Link
KTH	TWI	Published	Analyzing Dynamic Operational Conditions of Limb Prosthetic Sockets with a Mechatronics-Twin Framework	MDPI Applied Sciences	10.3390/app12030986		Link

Main Author	Contributors	Status	Title	Name of journal or magazine	Date of publication	DOI	URL
KTH		Published	A Mechatronics-twin Framework based on Stewart Platform for Effective Exploration of Operational Behaviors of Prosthetic Sockets with Amputees	Proceedings of the 15th International Joint Conference on Biomedical Engineering Systems and Technologies - BIODEVICES	10.5220/0001083600003123		Link
KTH	Lusstech, RISE, NM, Ossur, TU, TWI	Published	Wearable pressure sensing for lower limb amputees	2022 IEEE Biomedical Circuits and Systems Conference (BioCAS)	10.1109/biocas54905.2022.9948616		Link
TU	KTH	Planned	Biomechanical modelling for effective operational feature identification and analysis	Journal paper			
TU	SAS, STHNHSTF, Össur	Planned	Socket pressure and discomfort in lower-limb prostheses: a preliminary study	Journal paper			
STHNHSTF	TU, SAS	Planned	Protocol (title TBC)	Methods and Protocol Open Access			
KTH	TU	Planned	Biomechanical modelling for effective operational feature identification and analysis				
KTH	TU, SAS, TWI	Planned	Encoding Knowledge of Bio-mechanical Operational Properties of Limb Prosthetic Sockets for Effective Comfort Profiling	IEEE Trans			

Main Author	Contributors	Status	Title	Name of journal or magazine	Date of publication	DOI	URL
TU	All members consort.	Planned	Mapping Lower-Limb Prosthesis Pressure Distributions Using Novel Measurement System	IEEE TRANSACTIONS on Biomedical Engineering			

Key highlight includes a special Issue in the MDPI Sensors journal initiated by SocketSense and can be accessed here: https://www.mdpi.com/journal/sensors/special_issues/prosthetics. The Guest Editors were from KTH and RISE IVF.

Four publications have been submitted to conferences (ISB 2021 & CF'21) and are currently under review; furthermore, one more publication will be submitted in May 2021 to the IEEE EMBC 2021 conference. Submissions to conferences were limited in part due to the Covid-19 pandemic. A presentation was made at the BioCAS 2022, IEEE Biomedical Circuits and Systems Conference with a subsequent presentation.

Additionally, a White Paper has been prepared and published on the SocketSense website about how quantum materials have the potential to revolutionise prosthetics.

3.9.2 Events & Conferences

SocketSense partners participated in events relevant to the project in order to increase its visibility and establish new contacts. National and international conferences provide the opportunity to share the experiences and results with relevant experts, therefore, to achieve an effective dissemination of the project. Workshops, meetings and other large events (exhibitions, trade fairs, showcases) are also excellent platforms for disseminating findings and to start direct conversations with target audiences. Table 9 presents selected events and indicates the dissemination activities and their impact.

Table 9 Monitoring & Targeting of Dissemination Events

Name of the event	Date	Status	Type	Place (Country/City)	Organizer	Participating Partner(s)	Type of audience	Size of audience	url
Cyber Physical Systems (CPS) Week	2019-04-15/18	Attended	Conference	Montreal, Canada		KTH	Scientific community, industry		Link
MedTech Innovation Expo 2019	2019-05-15	Attended	Conference	Birmingham, UK	MedTech	LTech	Scientific community, industry, medical professionals, Policy makers, customers	4,000+ from / 30 countries	Link
Rehabilitation centre visit	2019-06-12	Attended	Workshop	Middlesbrough, UK	STHNHSTF	All partners	Scientific community, industry, medical professionals, patients	20	-
MedInfo 2019	2019-08-25/30	Attended	Conference	Lyon, France	AIM	SAS	Scientific community, industry, medical professionals	3000+	Link
Digital Excellence Forum	2019-09-19/20	Attended	Conference	Helsinki, Finland	European Commission	NM	Scientific community, industry, Policy makers, Media	3,000	Link
IDTechEx Healthcare Sensor Innovations 2019 Conference &Exhibition	2019-09-25/26	Attended	Conference	Cambridge, UK	IDTechEx	LTech	Scientific community, industry, medical professionals, Policy makers, customers	approx. 1000	Link
Presentation in the Ministry of Research in Frankfurt	2019-10-01	Attended	Presentation	Frankfurt, Germany	Ministry of Research (Germany)	NM	Scientific community, Policy makers	120	Link
NHS Innovation: What, why and how?	2019-10-03	Attended	Conference	Middlesbrough , UK	STHNHSFT	STHNHSFT	Scientific community, industry, medical professionals	30	-
SINTEC - SocketSense Collaboration planning meeting	2019-10-04	Attended	Meeting	Uppsala, Sweden	Uppsala Universitet & KTH	KTH	Scientific community	5	-
Giant Health Event	2019-10-15/16	Attended	Event - Other	London, UK		TU	Scientific community, industry, medical professionals, Policy makers	2000+	Link

Name of the event	Date	Status	Type	Place (Country/City)	Organizer	Participating Partner(s)	Type of audience	Size of audience	url
EPoSS Annual Forum	2019-10-17	Attended	Workshop	San Sebastian, Spain	EPoSS	RISE IVF	Scientific community, industry, Policy makers	75	Link
Smart Bioelectronic and Wearable System	2019-10-22/23	Attended	Workshop	Brussels, Belgium	European Commission	KTH, RISE IVF, LTech, Össur	Scientific community, industry, Policy makers		Link
TWI Innovation Summit	2019-11-07	Attended	Conference	Athens, Greece	TWI Hellas	TWI, NM	Scientific community, industry, civil society, general public, Policy makers, media	100	Link
XXIV Congreso de la Sociedad Andaluza de Calidad Asistencial	2019-11-14/15	Attended	Congress	Antequera, Spain	Sociedad Andaluza de Calidad Sanitaria (Andalusian Society of Healthcare Quality)	SAS	Scientific community, industry, medical professionals, Policy makers, customers		Link
HIC (Healthcare Innovation Centre) Workshop	2019-12-12	Attended	Workshop	Middlesbrough, UK	TU	TU, LTech	Scientific community, experts with ethics, research governance and clinical trials background	40	-
6th annual Innovations in Large-Area Electronics Conference (innoLAE 2020)	2020-01-21&22	Attended	Conference	Cambridge, UK		LTech, TU	Scientific community, industry, medical professionals, policy makers, media, customers	hundreds	Link
New Paradigms in Transfemoral Prosthetics: The Future of Amputees	2020-02-27	Attended	Workshop	Seville, Spain	SAS	SAS	Scientific community, medical professionals, civil society, policy makers	21	-
Tech Spirit Barcelona – eHealth sessions	2020-02-25/27	Attended	Conference & brokerage event	Virtual	Barcelona Tech City	NM	Scientific community, industry, medical professionals, policy makers, customers	300	Link

Name of the event	Date	Status	Type	Place (Country/City)	Organizer	Participating Partner(s)	Type of audience	Size of audience	url
Inforsalud 2020	2020-03-03/05	Attended	Conference	Madrid, Spain	Sociedad Española Informática de la Salud	SAS	Scientific community, medical professionals, industry, civil society, policy makers	?	Link
WhySummit – Future of Health	2020-06-18	Attended	Summit & Networking event	Virtual	Why Summit S.R.O	NM	Scientific community, industry, medical professionals, policy makers, healthcare providers, pharma & biotech companies	1000	Link
Edinburgh University Scottish Microelectronics Centre INSPIRE event	2020-07-15	Attended	Workshop	Virtual	Edinburgh University, UK	LTech	Scientific community, students	12	-
Edinburgh University Scottish Microelectronics Centre Summer STEM Event	2020-07-16	Attended	Workshop	Virtual	Edinburgh University, UK	LTech	Scientific community, students	20	-
VPH2020 conference	2020-08-24/28	Attended	Conference	Virtual		TU	Scientific community, industry, medical professional		Link
WeRob 2020	2020-10-13/16	Attended	Conference	Virtual		Ossur	Scientific community, industry	300+	Link
OTWorld & TAR	2020-10-27/29	Attended	International trade show, Conference ePoster	Virtual	Technische Universität Berlin, Fraunhofer IBMT, DGBMT	KTH, Ossur, TU	Scientific community, industry, medical professionals, customers	4,000	Link ePoster
Full Committee Meeting	2020-11-12	Attended	Meeting	Wales	HRA	TU	Policy makers	20	-

Name of the event	Date	Status	Type	Place (Country/City)	Organizer	Participating Partner(s)	Type of audience	Size of audience	url
Annual Scientific Meet of the Vascular Society of Great Britain and Northern Ireland	2020-11-24/27	Attended	Symposium	Virtual	Vascular Society of Great Britain and Northern Ireland	STHNHSFT	Scientific community, medical professionals	1,000	Link
European Forum for Electronic Components and Systems (EFECS2020)	2020-11-25/26	Attended	Conference, booth	Virtual	AENEAS, ARTEMIS-IA, EPOSS, ECSEL JU, European Commission	KTH, TWI, TU, LTech	Scientific community, industry, policy makers	>300	Link
Virtual Coffee with an Expert – Myoelectric prostheses	2020-12-09	Attended	Workshop	Virtual	KTH	All SocketSense partners	Scientific community, medical professionals, civil society	38	Link
6th Annual Living Heart Symposium	2020-12-15	Attended	Symposium	Virtual		TU	Scientific community, industry, medical professionals, policy makers, clinicians	600	Link
Master Thesis Seminar: Effective Optimization of Deployment for Wearable Sensors in Transfemoral Prosthesis	2020-12-18	Attended	Public Thesis Seminar	Virtual	KTH	All SocketSense partners	Scientific community, students	20	Link
7th Annual LSX World Congress 2021 (BioTech, HealthTech, Medtech)	2021-02-01/05	Attended	Conference	Virtual	LSX	TU	Scientific community, industry, investors, medical professionals	2,000	Link

Name of the event	Date	Status	Type	Place (Country/City)	Organizer	Participating Partner(s)	Type of audience	Size of audience	url
26th Congress of the European Society of Biomechanics	2021-07-11/14	Attended	Conference	Virtual		KTH	Scientific community, industry, medical professionals		Link
ISB 2021 (XXVIII CONGRESS OF THE INTERNATIONAL SOCIETY OF BIOMECHANICS	2021-07-25/29	Attended	Conference	Stockholm, Sweden /Virtual		TU, TWI	Scientific community, industry		Link
OTworld 2022	2022-05-10/13	Attended	International trade show, Conference	Leipzig, Germany		Ossur	Scientific community, industry, medical professionals, customers		Link
SINTEC Summer School – Smart Bioelectronic and Wearable Systems	2022-06-07/10	Attended	Summer School	Castione Della Presolana, Italy	KTH (Co-organizer)	KTH, TU.	Scientific community, industry, medical professional	50	Link
2022 IEEE Biomedical Circuits and Systems Conference (BioCAS)	2022-10-13/15	Attended	Conference	Taipei, Taiwan		KTH	Scientific community, industry		

The table below provides selected short reports that the SocketSense partners attended or organised.

Table 10: Short reports on dissemination events

MedTech Innovation Expo 2019

Date: 2019/05/15
Venue: Birmingham, UK
Participating partner: LussTech
Participation in the conference

Med-Tech Innovation Expo is the UK & Ireland's leading event for medical design and manufacturing technology.

Impact: Networking with innovators, suppliers & manufacturers from across the medical & healthcare sector.

Rehabilitation centre visit

Date: 2019/06/12
Venue: Middlesbrough, UK
Participating partner: STHNHSTF, All project partners
Organisation of SocketSense workshop

A visit at the Rehabilitation Centre of South Tees Hospitals was organised. The SocketSense project was presented to prosthetists and patients.

Impact: Expanding knowledge of prosthetics from patient and prosthetists' point of view to gain feedback and insight on stakeholders for all partners.


MedInfo 2019

Date: 2019/08/25-30
Venue: Lyon, France
Participating partner: SAS
Participation in the conference

MedInfo (World Congress of Medical and Health Informatics) is a worldwide key event in digital health that gathers scientists, physicians, teachers, students, companies, institutions, and decision-makers.

Impact: Networking with healthcare professionals, scientists, suppliers & manufacturers from the medical & healthcare sector.

Digital Excellence Forum

Date: 2019/09/19-20
Venue: Helsinki, Finland
Participating partner: Nuromedia

The event provided a forum to present and discuss the main policy drivers of the digital transformation of European industry. Nuromedia presented of the general idea of SocketSense at the Societal Challenges Panel.

Impact: General interest in research activities of SocketSense. Follow up on potential application of SocketSense solution in parallel markets.

IDTechEx Healthcare Sensor Innovations 2019 Conference &Exhibition

Date: 2019/09/25-26
Venue: Cambridge, UK
Participating partner: LussTech
Participation in the conference

Healthcare Sensor Innovations 2019 is a conference & exhibition focusing on latest developments in use of wearables & sensors in continuous monitoring of individuals & point-of-care diagnostics.

Impact: Expanded knowledge on novel technologies related to the project.

Presentation in the Ministry of Research in Frankfurt

Date: 2019/10/01
Venue: Frankfurt, Germany
Participating partner: Nuromedia
Presenter for H2020 Impact on SME and involvement in SocketSense project

Impact: General praise for development of innovative solutions and impact creation (towards the whole consortium).

NHS Innovation: What, why and how?

Date: 2019/10/03
Venue: Middlesbrough, UK
Participating partner: STHNHSFT
Participation in the conference

The event was organised by South Tees Hospitals NHS Foundation Trust and included short talks on different aspects of innovation, digital innovation and successful H2020 projects.

Impact: Invitation received to give a presentation and presented the project work to other stakeholders.

SINTEC - SocketSense Collaboration planning meeting

Date: 2019/10/04
Venue: Uppsala, Sweden
Participating partner: KTH
Organisation and participation in the meeting

This workshop was arranged for identifying common interests of SocketSense and another H2020 project SINTEC (https://www.sintec-project.eu/), regarding the technologies and dissemination activities.

Impact: Networking of research on stretchable and wearable technologies for medtech.

Giant Health Event

Date: 2019/10/15-16
Venue: London, UK
Participating partner: TU
Participation in the conference

The Global Innovation and New Technology Health Event is Europe's largest health technology innovation event, showcasing leading health tech from around the world.

Impact: Expanded knowledge on novel technologies related to the project.

EPoSS Annual Forum

Date: 2019/10/17
Venue: San Sebastian, Spain
Participating partner: RISE IVF
Presentation of the SocketSense project

EPoSS is an industry-driven policy initiative defining R&D and innovation needs as well as policy requirements related to Smart Systems Integration and integrated Micro- and Nanosystems. The SocketSense project was presented during the Smart Systems for Flexible Electronics and Wearables session. In addition to introducing the project the focus of the presentation was on the sensor material and the integration into the socket.

Impact: The presentation generated interest from the EPoSS community, several questions and suggestions on the technology came up during the discussion afterwards. New contacts were made, the contacts were added to the stakeholders' / dissemination list of the project.

Smart Bioelectronic and Wearable System

Date: 2019/10/22-23

Venue: Brussels, Belgium
Participating partners: KTH, RISE IVF, LussTech, Össur
Presentation & exhibition of the SocketSense project

SocketSense partners from KTH, RISE IVF, LussTech and Ossur participated the EC Workshop on Smart Bioelectronic and Wearable Systems. The workshop presented breakthroughs and innovations in smart bioelectronics and flexible & wearable systems. This workshop aimed to promote cross project communication while informing the current technology and policy trends.

On Day 1, during the "Project session" Professor Dejiu Chen (KTH) presented the overall strategy and related base technologies of SocketSense. In addition, the SocketSense team participated in the exhibition dedicated running and completed EU-funded projects.

Impact: Some questions regarding the innovation of the project were received and answered. New contacts were made, the contacts were added to the stakeholders' / dissemination list of the project.

TWI Innovation Summit

Date: 2019/11/07
Venue: Athens, Greece
Participating partner: TWI, Neuromedia
Organisation of workshop & presentation of the SocketSense project

Designed to engage and connect the innovation community across Europe, the Summit explored how to develop and exploit new technologies for business transformation. The event brough together representatives from entrepreneurial, engineering-based SMEs and R&T organisations. Nuromedia was invited as a guest speaker and presented the technology being developed in the SocketSense project.

Impact: Networking, sharing innovation insights and best practices.

XXIV Congreso de la Sociedad Andaluza de Calidad Asistencial

Date: 2019/11/14-15
Venue: Antequera, Spain
Participating partner: SAS
Presentation of the SocketSense project

The Congress of Andalusian Society for Healthcare Quality is the most important health event in the Andalusian Region, which brings together experts from the areas of health and social health.

Impact: The diffusion and communication of the project in the health field in the Andalusian Region. Inclusion of SocketSense project in the conference proceedings.

HIC (Healthcare Innovation Centre) Workshop

Date: 2019/12/12
Venue: Middlesbrough, UK
Participating partner: TU, LussTech
Participation in the workshop

The workshop was organised through the Teesside University Health and Wellbeing Grand Challenge and Teesside University-HIC (Healthcare Innovation Centre) in order to present HIC's work mixed with high profile external speakers from healthcare research areas. The event attracted academics from Teesside University School of Health & Life Sciences mainly with research, ethics, research governance and clinical trials background.

Impact: transferring knowledge while gathering the wider community and interested people together around particular topics. SocketSense was also broadly presented in this workshop.

InnoLEA 2020 conference

Date: 2020/01/21-22
Venue: Cambridge, UK
Participating partner: LussTech, TU
Poster presentation

The Innovations in Large-Area Electronics Conference (innoLAE 2020) is an important platform, where researchers, manufacturers, integrators and users involved in LAE can meet, build collaborations, share knowledge and promote the growth of the field and advance the state-of-the-art. LussTech presented the SocketSense project poster.

Impact: Engaged in discussions about the project & expanded network in the LAE field.

Tech Spirit Barcelona – eHealth sessions

Date: 2020/02/25-27
Venue: Virtual
Participating partner: Nuromedia
Participation in b2b webinars after main talks of the presenters

Tech Spirit Barcelona encompassed several entrepreneurship conferences and brought together networking meetings between entrepreneurs and international investment funds.

Impact: Understanding the market development from a commercial SME point of view. Technology applied to health webinar.

New Paradigms in Transfemoral Prosthetics: The Future of Amputees

Date: 2020/02/27
Venue: Seville, Spain
Participating partner: SAS
Organisation of SocketSense workshop

SAS organised a dedicated SocketSense workshop. The participants were amputee patients, personnel from amputee associations, prosthetics, clinics from the rehabilitation service of the Virgen del Rocío Hospital in Seville, research personnel from the Virgen del Rocío Hospital in Seville and management personnel from the Virgen del Rocío Hospital. There were 21 participants.

Impact: Raising awareness about the project, direct contact and discussions with prosthetists, clinicians and patients. The workshop participants gave positive feedback on the project and contacted the project representatives for further details.

Inforsalud 2020 (XXIII National Congress of Health Informatics)

Date: 2020/03/03-05
Venue: Madrid, Spain
Participating partner: SAS
Presentation of the SocketSense project

The event offered a unique opportunity for health professionals, technologists, researchers, managers, industry, public administrations and health and social organizations (public and private) to expose and share their demands and needs, as well as discuss how to move forward in transforming the health system with the help of ICT.

Impact: The diffusion and communication of the project. It is one main congress of IT and Health in Spain.

WhySummit – Future of Health Virtual

Date: 2020/06/18
Venue: Virtual
Participating partner: Nuromedia
Participation in the conference, connecting to the relevant stakeholders through b2b matches

Future of Health Virtual brought together experts across healthcare providers, pharma & biotech, tech companies, investors, policymakers, academia, research & innovation centers to tackle the toughest challenges & opportunities of the health ecosystem.

Impact: Gathered insights into exploitation of eHealth tech products, collected contact details of stakeholders interested specifically in the outcomes of SocketSense.

Edinburgh University Scottish Microelectronics Centre INSPIRE event

Date: 2020/07/15
Venue: Virtual
Participating partner: LussTech
Participation in the workshop

A workshop event organised by Edinburgh University Electronics Engineering Department to INSPIRE students re: STEM (science, technology, engineering, maths) topics. LussTech presented the project concept to members of staff and students and engaged in discussions.

Impact: Presented the project concept to scientific community members & engaged in discussions & expended network in the scientific community.

Edinburgh University Scottish Microelectronics Centre Summer STEM Event

Date: 2020/07/16
Venue: Virtual
Participating partner: LussTech
Participation in the workshop

A second workshop event organised by Edinburgh University Electronics Engineering Dept for students re: STEM topics. LussTech presented the project concept to other members of staff and students and engaged in discussions.

Impact: Presented the project concept to scientific community members & engaged in discussions & expanded network in the scientific community.

VPH2020 Conference

Date: 2020/08/24-28
Venue: Virtual
Participating partner: TU
Participation in the conference

The event was focusing on Virtual Physiological Human and more broadly to Computational Systems Biomedicine, as well as applications in clinical settings, underpinning the move towards predictive personalised medicine.

Impact: The biggest impact was the training sessions which were providing the mathematical, physical and computer science backgrounds in order to start in the best conditions with the simulation framework.

WeRob2020

Date: 2020/10/13-16
Venue: Virtual
Participating partner: Össur
Participation in the conference

WeRob is a premier European conference on wearable robotics for both the medical and industrial sectors, which provides a forum for researchers and practitioners to report the latest innovations, discuss state-of-the art techniques, exchange ideas and advances in the field.

Impact: Networking with researchers and innovators, presentations from other projects and general policy discussions. Very useful information on legal and regulatory aspects.

OTWorld

Date: 2020/10/27-30
Venue: Virtual
Participating partner: KTH, Ossur, TU
Poster presentation

SocketSense presented an ePoster at the international trade show, OTWorld (https://www.ot-world.com/), which was held exclusively online due to the situation regarding the pandemic. The ePoster introduces a short description of the methodology and findings from the review study on the pressure load characteristics at the stump-socket interface of transfemoral amputees (TFAs), which was done in collaboration by partners of the SocketSense consortium, KTH, TU, and Ossur.

Impact: Dissemination of project to a prominent industry platform for prosthetics, orthotics, orthopaedic footwear technology, compression therapy and individual rehabilitation technology and virtual exchange with medical professionals.

Full Committee Meeting, Health Research Authority

Date: 2020/11/12
Venue: Wales
Participating partner: TU
Participation in a meeting

TU attended a Full Committee Meeting to review ethics application with Health Research Authority (HRA), for T4.3 (Basic science study involving procedures with human participants called “An investigation into residual limb-socket interface pressures and their relationship with perceived levels of socket comfort in trans-femoral amputees”).

Impact: Engagement with authorities regarding regulatory compliance.

Vascular Societies' Annual Scientific Meeting 2020

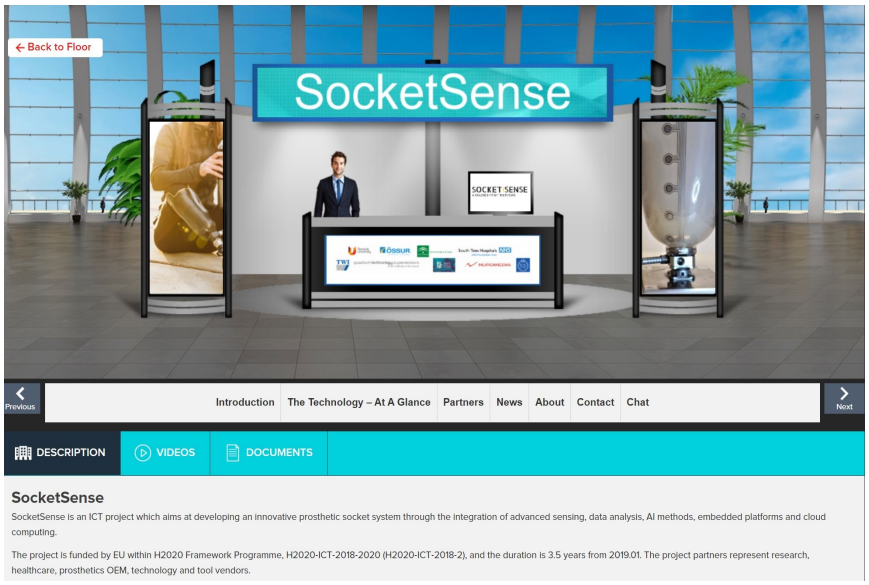
Date: 2020/11/24-27
Venue: Virtual
Participating partner: STHNHSFT
Poster presentation & participation in the conference

The Vascular Societies' Annual Scientific Meeting 2020 was held virtually between 24th - 27th November 2020. The Meeting saw an over 1,000 attendees log onto the conference portal to watch live or after the event.

Impact: A poster entitled ‘A multi-centre technology validation to analyse the efficacy and efficiency of the SocketSense sensor embedded in the patient prosthesis’ was presented during the event to medical professionals.

European Forum for Electronic Components and Systems (EFECS) 2020

Date: 2020/11/25-26
Venue: Virtual
Participating partner: KTH, TWI, TU, LTech
Participation in the conference with a virtual booth



EFECS aims to promote the cooperation and networking opportunities across the Electronic Components & Systems (ECS) community and a variety of application domains (including medical and health care electronics system). The 2020 edition was jointly organised by AENEAS, ARTEMIS-IA, EPoSS, ECSEL Joint Undertaking and the European Commission, in association with EUREKA and BMBF. SocketSense participated with a virtual booth, where a range of project dissemination tools were presented (project website, poster presentation, white paper, video).

Impact: Networking with stakeholders, insight into future trends and latest technological developments and links to the relevant instruments, dissemination of project.

Virtual Coffee with an Expert - Myoelectric prostheses

Date: 2020/12/09
Venue: Virtual
Participating partner: All SocketSense partners
Organisation of SocketSense workshop

The purpose of the event was to spread knowledge to both academia and industry in different areas of current research and technological advances within cyber-physical systems. This specific event was organized to give researchers from the SocketSense project a possibility to learn from the research done by Helen Lindner that is a senior lecturer in occupational therapy at Örebro University in Sweden and exchange experiences that are both relevant to us and outside the core competence of the consortium.

Impact: Information about the possible adaptiveness of prosthesis interaction over time, from an occupational therapy perspective.

6th Annual Living Heart Symposium

Date: 2020/12/15
Venue: Virtual
Participating partner: TU
Participation in the symposium

The event brought together virtually leaders from academia, medical device, and pharmaceutical industries, clinicians, and regulators to share the most current advances in the use of simulation for the human body for the development of new treatments and precision patient care. Multidisciplinary panels addressed the key challenges and identified synergies culminating in a roadmap to simulating the human body.

Impact: The impact of this event was discovering cutting-edge virtual twin applications, conversing with like-minded peers in the medical device and pharmaceutical industries, research centers, clinical practice, learning the latest on the FDA position on the use of modelling and simulation of virtual patients and meeting experts.

Master thesis seminar: Effective Optimization of Deployment for Wearable Sensors in Transfemoral Prosthesis

Date: 2020/12/18
Venue: Virtual
Participating partner: KTH, TU, LussTech, TWI, Ossur, STHNHSFT
Organisation of KTH Mechatronics (MMK)

The degree project of a Master's student of KTH was tied to the SocketSense project. During the seminar he presented a study addressing the problem of optimized deployment of pressure sensors/transducers within TF amputee sockets. The study provided a simulation method for characterizing the intra-socket operational conditions, based on a tool-chain connecting biomechanical simulation and FEA. All SocketSense partners were invited. Participants included KTH students, researchers, and external collaborators.

Impact: The simulation method enables the first systematic characterization of socket operational characteristics, paving a basis for data analysis and sensor tests. Dissemination of results to academia.

7th Annual LSX World Congress 2021 Virtual

Date: 2021/02/01-05
Venue: Virtual
Participating partner: TU
Participation in the conference

LSX World Congress has been bringing together the executives that matter to the future of healthcare and life science strategy, investment, partnering and deal making. It represents the breadth and depth of the cutting-edge research and technology driving the advances in the industry right now and in the near future.

Impact: The impact of this event was the opportunity of quality peer-to-peer discussion and high-level networking.

SINTEC Summer School 2022

Date: 2022/06/07-10
Venue: Physical
Participating partner: KTH, TU
Participation in the conference

This summer school is co-organized by SINTEC (Smart Bioelectronic and Wearable Systems) along with three EU-funded projects: SocketSense (comfortable and personalized prosthetics), Welmo (wearable electronics for effective lung monitoring) and Life Champs (a collective intelligent platform in support of cancer champions). It took place between 7-10 June 2022, at Castione della Presolana in Northern Italy.

The four-day SINTEC School was focused on wearables with embedded sports/health applications, IOT for wearable health and sport monitoring, as well as stretchable electronics. Throughout the event, scientists and industry leaders communicated on how a classic PCB technology for healthcare and sports monitoring. Regarding the SocketSense, researchers from KTH and TU presented the work on clinical trials, biomechanical modelling, sensor deployment and situation assessment.


3.9.3 Academic training

Based on SocketSense, KTH has been actively running 3 project courses (one course in 2019, two courses in 2020) for the master level education in mechatronics and embedded systems. These courses, named “SocketSense Advanced Course” (15.0 credits), aim to provide the students with professional skills in applying state-of-the-art technologies and in practicing project communication and management. From SocketSense, the support is centred on the explorative development of an experimental platform for the simulation and dynamic testing of complex biomechanical behaviours. The main result is a Steward Manipulator (v1) which aims to serve the role of “artificial patient”. The courses run jointly with other project courses, and students with other foci have taken part of the SocketSense results and provided feedback in return. Each project course has thus included 7~10 students, but the total outreach is about 100 students. Two master theses were prepared and published (see Table 8).

4. Monitoring, reporting, and evaluation

4.1 Distribution of responsibilities

Dissemination was carried out through a combination of TWI and TU and represented the main points of contact for external communications and for the publication of the content that will be generated during the project (articles, images or videos) in different dissemination channels to maximise the reach of the project.

All consortium partners were supported by the WP7 Lead KTH to define their individual dissemination activities and to be actively involved in them. The SocketSense partners participated in the dissemination of the project results by:

- Attending events like conferences, workshops, exhibitions and B2B, related to SocketSense (a list events can be found in Table 9) and presenting the project and the achieved results;
- Providing content (pictures, videos, press releases, articles etc.) related to their work packages;
- Informing the consortium about opportunities they become aware of for increasing the reach of the project (relevant events, publications, newsletters etc.);
- Reporting on the dissemination activities that are implemented by them.

4.2 Dissemination rules and policy

During the dissemination activities of the project the partners should take into account issues related to IP. The partners come to an agreement when it comes to the publication of confidential information of another partner.

In the event of publication of results that have been jointly developed by project partners, each partner should give consent for that publication. Before publication the articles should be reviewed by the Project Coordinator and the Dissemination Promoter in order to check any potential conflicts with other articles and to decide together with the steering committee if this article can be published.

In order to avoid any conflicts between the partners the guidelines in the relevant articles in the GA should be followed. According to Article 29.1 of the GA:

"A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests."

The content that will be produced should follow the graphic identity of the project, which can be found in section 3.1 in order to increase the recognition of the project. This means that the content used for the dissemination should include:

- the name of the project: SocketSense

- the url of the project's website: www.socketsense.eu
- Acknowledgment of the EC funding, including the EC flag and the indication of Horizon 2020

Any publications that will be produced by any of the project partners that is based on work/activities that took place in the framework of the SocketSense project should acknowledge the connection with the project and the fact that these activities were funded by the EC.

4.3 Monitoring and reporting of dissemination activities

Reporting is essential to ensure that we keep track of all dissemination and communication activities that were performed. Project partners are expected to continuously report any dissemination activities and their results.

For each event attended, partners will fill out the Dissemination Event report template that will gather:

- Information regarding the event and the role of the SocketSense partner
- Relevant metrics regarding the event (nr of participants, meetings that took place etc.)
- Questions raised and any comments/feedback received from the participating partners from the event audience

The report template for the dissemination events can be found in Annex 1.

The information provided by the project partners allowed monitoring of progress and the impact of the dissemination activities by providing both qualitative and quantitative data regarding these activities. The information was used to reassess these activities during the project progress meetings every 6 months. The process of monitoring of dissemination activities is highlighted below:

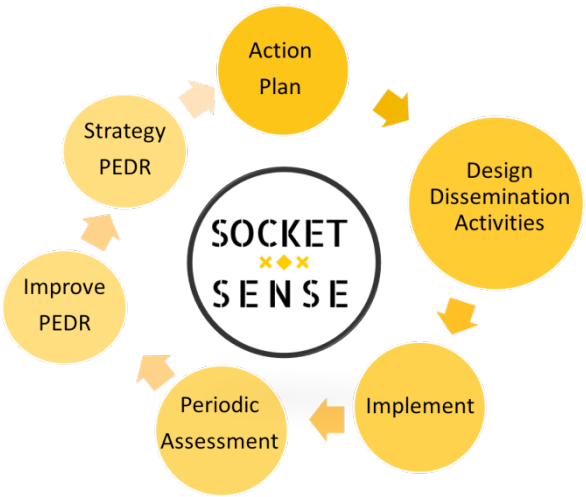


Figure 4: Monitoring of dissemination activities

As given in Figure 4, monitoring was a continuous process to assess the overall dissemination activities and results, but also evaluate each individual activity and its impact on the project as a whole. The Dissemination Plan was update based on the results of such evaluation.

4.4 Key performance indicators

In order to measure and assess the dissemination activities in terms of their relevance, quality, and promotion channel, and thus help the consortium to understand the reach and sustainability of the project's results, a number of Key Performance Indicators (KPI) were set up within Socket Sense. These indicators, which represent the minimum expected outreach, are presented in the table below.

Table 11 Key Performance Indicators for Dissemination Activities

Action	Description	KPI	M48 Target	Achieved (M10)	Achieved (M26)	TOTAL
1. Scientific Dissemination	Publications in high impact factor scientific journals and magazines about general progress of SocketSense will be regularly performed to ensure the rapid and effective dissemination of important findings among the international scientific community and contribute to increasing the scientific and technological capab ility of Europe in Prosthetics	Number of joint publications by the project partners with acknowledgement to SocketSense Grant.	5	0	0	9
2. Dissemination events	Spread the results of the projects on several high- level scientific European and international conferences and symposia in prosthetic field.	Number of comprehensive reports obtained from meetings, workshops attended.	30	11	20	44
3. Connection with European Networks	Participation in a variety of networks in the area of the development of new prosthetic tools as well as in other relevant communities of medical sectors and collaborate in (inter)national research projects.	Number of report meetings with European stakeholders such as: patients, prosthetic industry, clinicians, regulatory and national health system representatives.	10	4	3	9
4. Academic training	PhD students which constitute an immediate audience for the project achievements through well- established dissemination channels, such as scientific sessions, seminars and courses normally open for dissemination among a highly specialised audience. Additionally, KTH and Teesside University are actively involved in teaching and education in particular to masters	Number of scientists attending training courses and SocketSense workshops.	100	4	143	147

Action	Description	KPI	M48 Target	Achieved (M10)	Achieved (M26)	TOTAL
	and Doctoral programs in diverse fields connected to this project.					
5. Raising public awareness	SocketSense is motivated to increase the cancer diagnosis of European citizens, raising awareness inside the society on the potential impact of new and emerging technologies, such as the ones to be developed in the framework of the project. It is SocketSense Consortium's duty to ensure that questions are answered and that the program and its goals are transparent. In this sense contacts with the media (i.e. press, TV/radio, popular scientific journals, etc.) will take place.	Number of press releases and communication to general audience and patients. (Web and social media analytics: page views, downloads, visitors, hits, followers, etc. with the same level of performance as other H2020 projects.)	15	9	29	39

5. Section B: EXPLOITATION PLAN

This section of the document presents the Exploitation Plan of the SocketSense project and the exploitation plans of the project partners. However, D7.8 being a public deliverable and partners being committed to protect their IP, only a general overview is disclosed in order not to compromise future patent applications and other IP protection measures as well as identification of market potential which might benefit competitors.

The main goal of the Exploitation Plan is to magnify the impact of the innovative socket system by preparing its commercial uptake and to plan the transition of the SocketSense technology from a technology concept to a marketed medical device. This Plan outlines the activities that were implemented during the project in order to achieve a successful exploitation of the project's results. Each partner was involved in a continuous process of technology transfer and absorption throughout the development phase.

The basis for the implementation of the results of SocketSense is the strong demonstration focus of the project (rather than a theoretical approach). Significant effort is dedicated to trials and tests at lab scale (as well as in hospitals) combined with the assessment and verification tools that will provide the knowledge base for informed decisions by high-level decision makers of the end user partners at SAS and STH.

An initial business model with the SocketSense partners is displayed in the figure below:

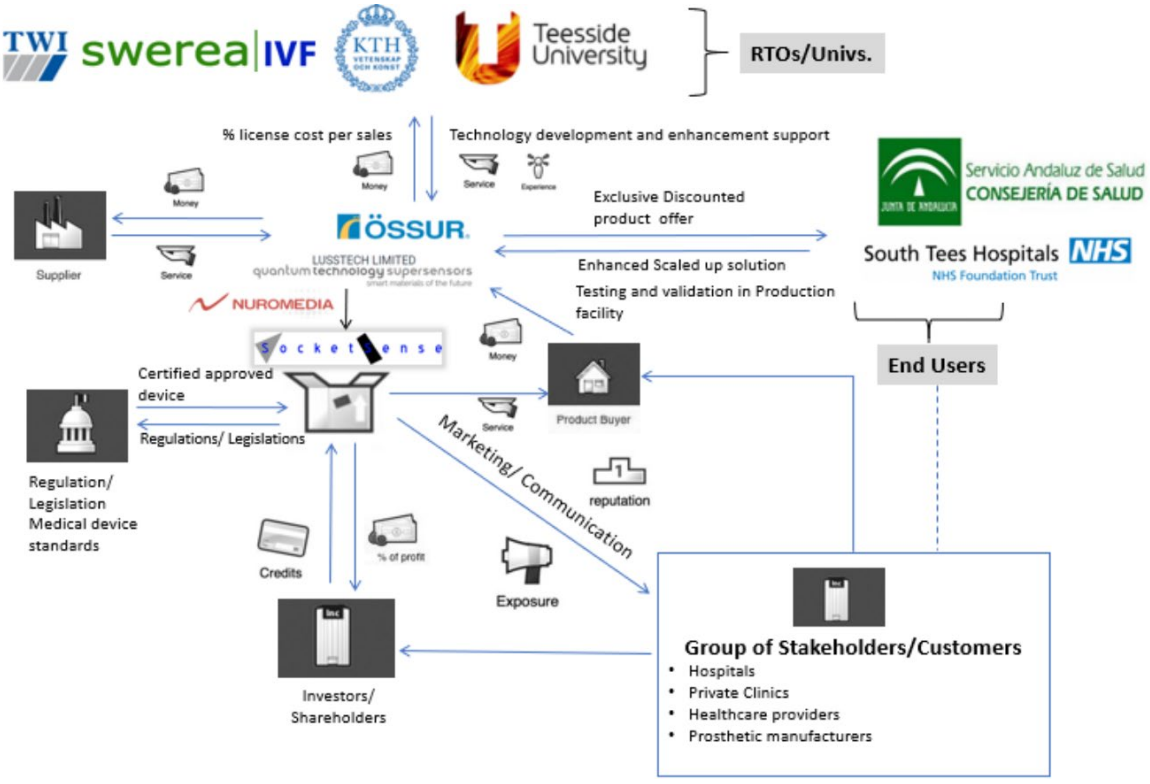


Figure 5: SocketSense business model (Board of Innovation)

5.1 Exploitation methodology

Activities related to exploitation will be performed under Task 7.3 Valorisation of Research Results (starting in Month 28) and Task 7.4 Project Business Plan and Commercialisation Roadmap (starting in Month 32). In the frame of these tasks, we will specify what type of exploitation is foreseen after the project's end for the project results.

The SocketSense exploitation methodology is structured in a three-step process:

- The first critical step of the process is the **identification of project exploitable assets**. Each exploitable result will be analysed, and their exploitation potential will be evaluated.
- The second step will focus on the **evaluation of the business case / business potential** of the exploitable results. The main objective of this step is to assess the strategic fit of exploitable results to the market and to explore if there is an accessible market for the results.
- The third step of the methodology is dedicated to the **development of** exploitation strategy and **business plan** of SocketSense.

5.1.1 Identification of exploitable results

In the development of the exploitation plan it is essential to start with the identification and characterisation of the exploitable results and understand their technology maturity level. Certainly not all project outcomes are likely to have an exploitation route. Exploitable results are only those that create revenues or have a potential scientific or social impact.

In order to support the partners in identifying exploitable results, a specific form has been designed ("Exploitable Outcomes"), which intends to collect information about the project outcomes and sub-outcomes. On the form, partners are requested to describe the exploitable result and provide details on how they will use the results, IP protection approach, concrete actions to make the results exploitable, as well as expected economic and socioeconomic impact. The identification of the exploitable results was an ongoing process with the Exploitable Outcomes form updated by the partners every six months. The information gathered enabled the project partners to assess how the project outcomes can be exploited and to decide whether to pursue IP protection.

Table 12 shows the project results identified within SocketSense together with short descriptions and the partner identified as responsible for the result development. Partners contributing to the development of the particular results are also presented.

Table 12 List of Project Results

Title of the Exploitable Result(s)	Description of Exploitable Result	Exploitation form	Lead Partner	Participating partners	Sector(s) of application
Socket System	Minimal Viable Product for SocketSense system	Commercial exploitation - Product & Service	Ossur	Whole consortium	Prosthetic Care
QTSS sensors	QTSS sensors for sensing pressure, friction & shear	Commercial exploitation - Product	LTech	IVF	Prosthetics, printed electronic sensor market & medical devices
Software solution	GUI based software solution that integrates data readout, visualizes embedded system /sensorial/environmental/other data, provides interfaces for communication between hardware components and front-end applications. Clinical interfaces and databases. Implementation of Rectification Script by TWI.	Commercial exploitation - Product & Service	NM	TWI	O&P but can be expanded to any health information systems
Data acquisition hardware	An embedded computer system is built up to read, store and communicate sensor data.	Education Hardware system together with its embedded software.	KTH		University education
QTSS Sensor Assembly Techniques	Novel design of multi-sense sensor strip for prosthetic fit	Commercial exploitation – Product	IVF & LTech	Ossur	Medical technology
Biomechanical models	Biomechanical models for comfort of prosthetic	Potential IP, Further research, further scientific developments and education	TU	SAS, STHNHSFT, TWI, KTH, Ossur	Higher education

5.1.2 Evaluation of business case

This stage helped in the creation of tailor-made business models for the results with a high exploitation potential selected in the previous step.

5.1.2.1 Market assessment

A market assessment was performed to evaluate SocketSense exploitation results and their prospect on the market. The assessment identifies and examines relevant markets and evaluates the opportunities for the exploitable results.

Our analysis focussed on:

1. Market analysis
    a. Potential gaps in the market & competition analysis
    b. Clinical benefits & reimbursement codes
    c. Intellectual property & trade secrets
2. How to prioritize features for our product
3. Pricing structure for our product
4. Path to market
5. Pivoting / Cross selling opportunities
    a. Digital health integration
    b. Expansion of service opportunities
    c. Pressure monitoring for other applications

Market Analysis

The primary target market group are lower limb amputees who are able to be fitted with a prosthesis. Market analysis indicates that of the 653,000 new lower limb amputees per year, 30-35% are fitted with a prosthesis (Figure 6). At present, Ottobock and Össur are the world market leaders in prosthetics.

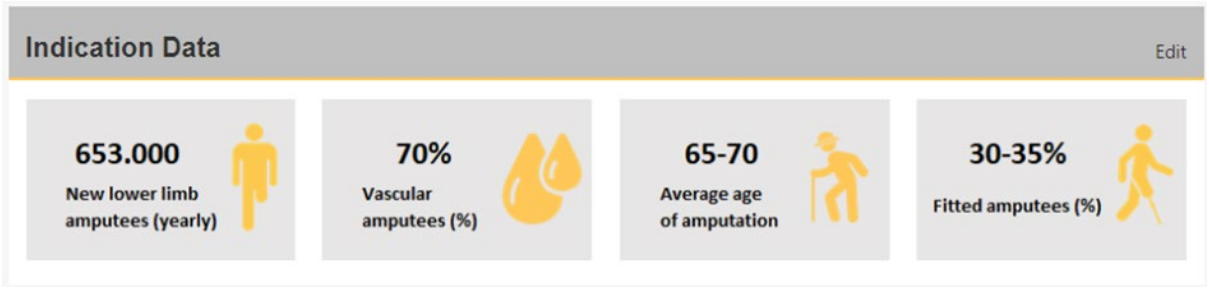


Figure 6: Lower limb amputees market indications data. (Internal source, Össur)

Four key strategies for market entry exist: market penetration, market development, product development, and diversification (see Figure 7). SocketSense has identified two product scenarios: 1) short-term Decision Support System (DSS), e.g. for socket fitting, and 2) long-term monitoring. In the former product scenario, the market competitor is the traditional socket fitting method – using trial and error and qualitative feedback in iterative socket design and alignment. The F-socket system by Tek-Scan (www.tekscan.com) and pliance-RLS prosthesis system (www.novel.de) utilise sensing matrices at the residual limb-socket interface, however, there exists little information on the uptake of this device during socket fitting. The end-user in this scenario is the prosthetist. With regards to the latter product scenario, there is currently no widely used device on the market for long-term monitoring. The end-user in this case is the amputee. The first product scenario (DSS) is a new product aimed at an existing market, while the second product scenario diversifies the market as it is a new product that will be introduced

to a new market. Risk can therefore be minimized by first introducing the DSS SocketSense system to an existing market, before re-introducing the device for long-term monitoring to a new market.

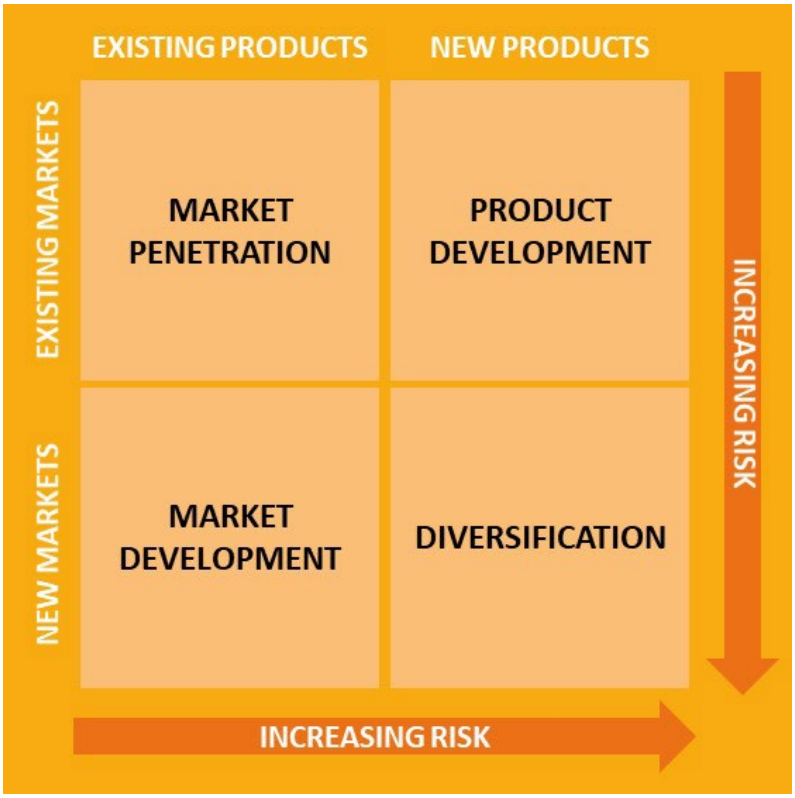


Figure 7: Four key strategies for market entry

When marketing a medical device, clinical data supporting clinical benefits of the device are of particular importance for reimbursement. In the DSS product instance, it may be possible to initially place the product on the market without reimbursement to first acquire clinical supporting data that can then be used to initiate a new reimbursement code. Whereas, in the long-term monitoring scenario, it may be advantageous to design the product such that it delivers according to a pre-existing reimbursement code and obtain clinical data to support this.

During competition analysis, investigating existing intellectual property (IP) is crucial to avoid infringement. Equally, the potential for IP output from the project should be assessed in this phase. Considerations of these may alter the technology, material, methods, etc. selected during the development phase. Furthermore, in this phase it is key to recognise where some aspects should remain trade secrets, such as algorithms and methodologies.

Feature Prioritization

During the prototyping phase of product development, the main focus is safety i.e. strict adherence and fulfilment of the safety requirements and hazard analysis. Additional features are usually required before the prototype can be considered a minimal viable product (MVP). In the field of medical devices, the additional features are usually to indicate that the product has some clinical benefit. The DSS use-case scenario has a simple path to market. The technology level in this instance can be lower than that required for long-term monitoring. For instance, the durability and lifetime of the device are not limiting factors before the product is marketable. The trade-off is that fewer features will be available in this version. However, once this product

version has been established in the market, additional features can be incorporated – in the long-term monitoring system for instance. In the latter situation, the longevity of the device must be proven, and the robustness of each component evaluated prior to market. The combination of these features leads to a higher unit cost. Figure 8 presents the flexible cost/benefit structure of SocketSense due to its high modularity. The DSS product scenario is situated at the lower end of both price and features scale, whereas the long-term monitoring product covers the higher ends of both scales.

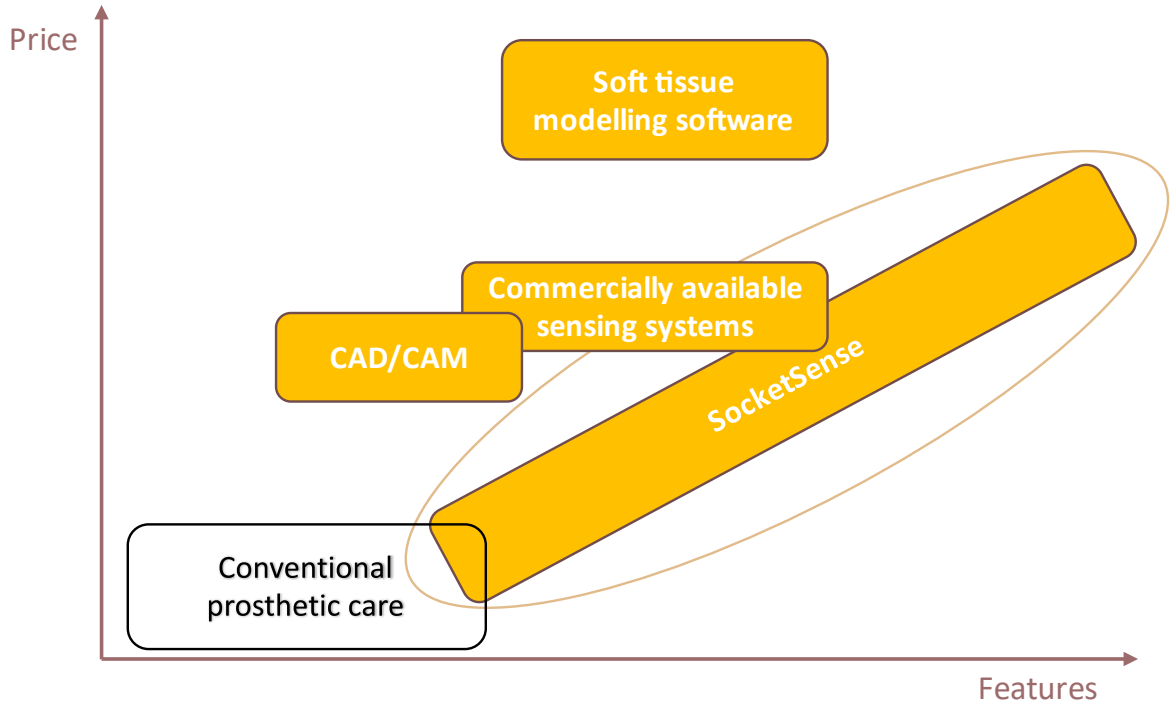


Figure 8: Example features-price relationship graph of SocketSense compared with other options available on the market

Pricing Structure

Project investment is based on the technical status of the project and is based on estimates of two accounts: 1) development cost, and 2) marketing and distribution costs. The variable costs are estimated based on the clinical outcomes of SocketSense. An estimated revenue per unit is calculated by altering the number of units sold to break even (Figure 9).

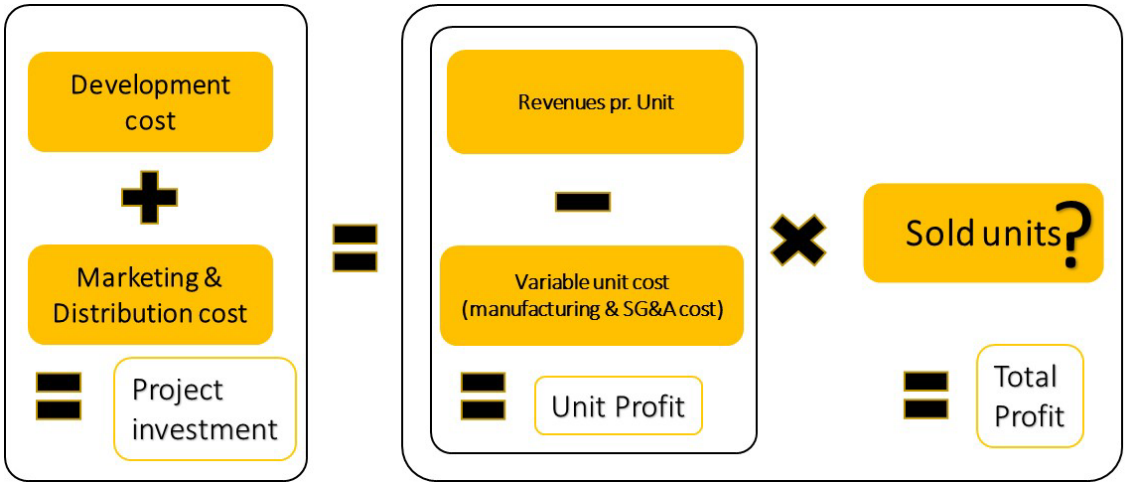


Figure 9: Pricing structure: a method of estimating revenue

Development costs are mostly one-time expenses that include research and development costs, clinical evaluation, approvals and quality check, manufacturing setup cost, travel, and training of sales personnel. Variable costs are initially low during development phase, and steadily increase as sales begin. The expected number of units sold can be evaluated from market data and reimbursement codes eligibility. An example of a product lifetime is depicted in Figure 10. When a new product is introduced to the market, there is a gradual sales and revenue growth. When competitor products enter the market, maximum growth rate occurs until maturity, and eventually product decline. The revenue (and return of investment) projection follows a similar trend, as meanwhile costs are initially high during development and manufacturing setup phase, they continue to decline throughout the rest of the product lifetime.

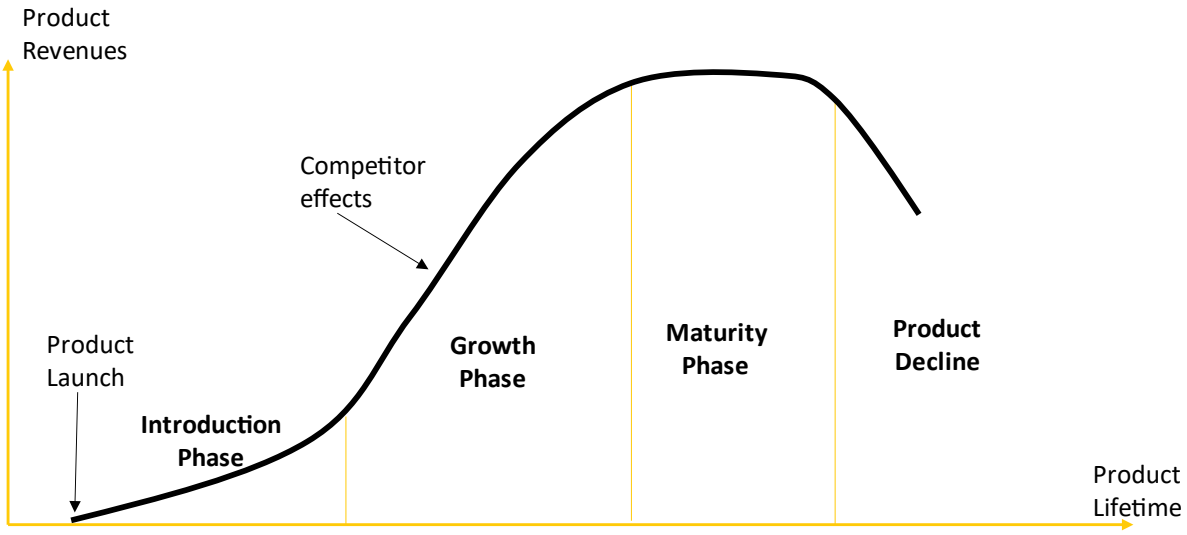


Figure 10: Example of revenue over a product's lifetime

Path to Market

Path to market is evaluated based on an objective assessment of the technical and product requirements of the MVP and the pricing strategy outcomes. It may be optimal for SocketSense to enter the market as a short-term socket fitting aid, with prospects of expanding the market for long-term monitoring.

Pivoting/Cross-selling Opportunities

Telehealth is a growing field with increasing interest in health monitoring across the globe. The Covid-19 pandemic further instigated the demand for remote services and minimising clinic visits. The long-term monitoring product scenario addresses this request for digital health integration. Furthermore, IP and trade secrets acquired through the development process can be exploited and introduced to new markets. Utilizing technology developed in this project and pivoting to other product domains can bring further revenue with little additional investment costs.

5.1.2.2 Workshops

A series of workshops have been organized predominantly to provide market insights and to stimulate feature prioritization.

Clinical Specialist Workshop

A clinical specialist workshop was organized and held on 24th March 2021 (Month 27). The aim of the workshop was to present the SocketSense technology to clinical experts to obtain feedback on the current status of the system, and whether they believe it would provide added benefit to current clinical practices. Roundtable points were prepared to stimulate discussions to provide insights on how clinicians foresee the use of such a system and to help guide future technological developments.

All SocketSense partners were invited to the workshop. In total, 19 participants joined the workshop, several of whom were potential external stakeholders, such as CPOs, gait laboratory specialists, and lower limb prosthetics engineers.

AGENDA
1. Introduction to SocketSense and welcome
2. Presentation on Pilot study
    a. System preparation
    b. Clinical study execution
    c. Results and discussion
3. Graphical user interface
4. Moderated roundtable discussion
    a. Would such a system solve a clinical problem you are currently faced with?
    b. For how high percentage of patients?
    c. What is the “worth” of this solution?
    d. Would you see this useful when provided in a check socket from central fabrication?
    e. What would be the most useful information provided in a graphical user interface?
    f. Would long term monitoring of patients be useful and why?
5. Conclusion and summary

The findings from the workshop will be used to gather intelligence for building the business case.

Exploitation Workshops

Exploitation workshops will be held with the participation of all SocketSense partners and, if appropriate, with external stakeholders. These workshops will provide a forum to discuss partners’ exploitable outcomes and define exploitation opportunities and strategies.

The first exploitation workshop is planned to take place in Month 30. During this workshop, partners will evaluate the exploitation opportunities focusing on the SocketSense core system but

will also explore alternative fields of use for the IP generated in the project. A deliverable will be issued with the outcome of this session.

PLANNED AGENDA

1. Introduction to exploitation strategy
    a. Main product track
        i. Discussion - Potential patent applications
    b. Exploitable outcomes
        i. Different fields of exploitation explained
        ii. Opportunities for patent applications outside of main field
2. Consortium roundtable
    Each partner has 5 minutes to describe exploitable outcomes
    - Idea description
    - Fields of exploitation
    - IP strategy
    - Rough estimate of value
3. Summary
    a. Internal Exploitable Outcomes Report

5.1.3 Business Plan development

In this step, individual exploitation plans and a joint business plan was developed. The Business Plan consolidated all of the evaluated information, forming a comprehensive roadmap to successful exploitation. The SocketSense Business Plan incorporated a route to market plan, marketing strategy, detailed sales plan, customer lists as well as financial projections, break-even-analysis and return on investment. Our analysis of the market and supply chains, plus the results of various trials and customer feedback will be used to improve the Business Plan, i.e. create contingencies, plans and alternative strategies & sensitivities.

Commercialisation Committee

A Commercialisation Committee has been established with representatives of all partners, for managing the overall progress of the exploitation activities and supporting the implementation of these activities. The chairman of the Committee was from Ossur, in the role of Commercialisation Manager. The Committee held regular meetings every three months, or as often as deemed necessary.

The main functions of the Commercialisation Committee were to:

- Review of project progress with regard to exploitation and commercialisation of the developed technologies
- Screen the intellectual property arising from the technical development and identification of exploitable results and outcomes suitable for IP protection
- Identify suitable exploitation routes for project results
- Provide guidance in the definition of exploitation plans of the individual partners
- Supervise the management of IP, identification of most suitable IP protection measures, organise any actions necessary to protect the generated Intellectual Property
- Review any intended publications to evaluate if any material needs protection prior publication

5.2 Intellectual Property and Knowledge Management

A proper management of knowledge and intellectual property is crucial to achieve an effective exploitation of the results. The IP and knowledge management will be implemented in line with the SocketSense Consortium Agreement (CA), which includes provisions regarding protection and publication of the IP that will be generated by the project, access rights to background IP and results for implementation and exploitation, how joint ownership will be regulated, dispute settlement, liability and confidentiality. IPR management will be led by Ossur, the Commercialisation Manager of the SocketSense project.

Background

The background knowledge that was held by the partners prior to signing the Grant agreement (e.g. existing knowledge, copyright, other IP) and which is needed for the implementation of the project is described in Attachment 1 "Background included" of the Consortium Agreement. The background will remain the absolute property of the owner, access rights for the background knowledge must be requested in writing. The partners give free access to their background knowledge needed by the other beneficiaries, for implementing the actions related to the project, unless otherwise agreed in Attachment 1 of the CA. Access rights to background needed for exploitation of a partner's own results shall be granted on fair and reasonable conditions.

Results

According to the Grant Agreement and Consortium Agreement, any results are owned by the partner who has generated them. When results are jointly developed by more partners, situations of joint ownership arise. In this case, joint owners shall establish a separate joint ownership agreement, where they agree on their rights and obligations, the IP protection measures and the division of related costs.

According to the definition in the Grant Agreement, "results" can take the form of any tangible or intangible outputs, whatever their form or nature, and regardless as to whether they can be protected by means of intellectual property law, as well as any rights attached to them, including intellectual property rights, e.g. designs, methods, models, software codes, processes, services, products, prototypes, knowledge, patents, etc.

Protection of results

Every partner will need to evaluate the possibility of protecting their results and select the most appropriate and effective IP protection mechanism, in accordance with the future planned use, particularly when direct commercial exploitation or further research will be targeted. Different means and mechanisms apply for the different kinds of results:

Subject Matter	Patent	Utility Model	Industrial Design	Copyright	Trade Mark	Confidential Information
Invention	X	X				X
Software	X[5]			X		X
Scientific article				X		
Design of a product			X	X	X	
Name of a product, service/project					X	
Know-How						X
Website			X	X	X	

Figure 11: Types of results and means of protection; Source: IPR Helpdesk

In order to establish the freedom to operate and ensure that exploitation of SocketSense results do not infringe existing third parties' rights, the consortium conducted a comprehensive patent search.

5.3 Partner specific exploitation plans

This section summarises the initial exploitation plans of partners, their interest and the opportunities partners expect from exploiting results. These preliminary plans were subsequently developed as the project progressed.

Table 13 Initial exploitation plans of partners

Partner	Initial Exploitation Plan
Ossur	Ossur is an international O&P manufacturer and distributor. Since the company designs, manufactures and sells prosthetic systems and service, it is interested in exploiting the SocketSense solution for prosthetic users. The potential value of the system is that the socket optimizing process can be simplified, saving time and cost for prosthetic workshop. The system would be made available through Ossur's current sales channels to prosthetic workshops. The outcome of the project will have to be evaluated against a potential business opportunity which may differ somewhat based on the success of the development of individual system modules and the level of clinical evidence acquired within the project. Below are listed the steps needed at the end of the project to evaluate the relevance of the technology and its development status. The outcome of this process is a comprehensive business case which indicates the market size needed for such a venture to be profitable: **EVALUATION OF CURRENT STATUS OF THE SOCKETSENSE SYSTEM** • Planned use of the SocketSense system • Results from the clinical validation of SocketSense prototypes • Expert view on the SocketSense prototype system **DECISION ON REQUIRED STEPS TOWARDS A MARKETABLE PRODUCT** • General market situation • Technical development • Clinical evaluation

Partner	Initial Exploitation Plan

	• Substantiation of claims
	• Quality system
	• Notified Body Approval
	• Sales and Marketing
	
	PREPARE ROADMAP TO MARKET FOR THE SOCKETSENSE SYSTEM
	• Importance of IP evaluated against level of market entry
	• Investment needed
	  ○ Development cost
	  ○ Selling, General and Administrative cost
	  ○ Variable unit cost
	• Income from product sales
	• Target market size for Return on Investment
	• Modest sales plan
	
	DEFINE KEY PERFORMANCE INDICATORS (KPIS)
	
	OTHER EXPLOITABLE OUTCOMES UPDATE

LTech	Quantum Technology Supersensors is a specialist materials development SME producing a new generation of smart & multifunctional materials that enable new sensing solutions. Its award winning QTSS materials open up new and exciting possibilities for more environmentally friendly, low weight & low-cost sensors in the prosthetics & medical devices markets. LussTech is looking to exploit its QTSS sensors through direct product sales and licensing in these high growth markets to increase sales.
NM	Nuromedia exploitation intention is to commercialise the provision of enhanced, value added services towards end users (whether those are O&P stakeholders, clinical personnel or an amputee), so as to expand its target groups, strengthen its position against competitors, increase technological and managerial competence, and expand its European business partner network. NM aims at the German and European service provision market towards enterprises to integrate SocketSense software (or a derivative of it) into their operation. At the same time, SocketSense results will have a significant and positive effect in terms of Nuromedia's services opening up new market areas expanding its portfolio of developed applications and services therefore strengthening its visibility and securing a market share. Finally, by researching and influencing the state-of-the-art, NM is secured to provide permanent innovation in its internal work processes and to participate in an emerging market. The knowledge which will be reached through the project will increase the profitability of other projects in clinical domains and increase the knowhow of the team with a sustainable, long-term positive effect.
KTH	KTH will use the embedded system as a basic sensor data processing platform to define and conduct course/master thesis projects for students in their educational programs.
IVF	The knowledge and expertise gained in the project will, in the short term, be used in other, national and international projects. Exploitation of the project results will be in the form of offering processing and test concepts as well as prototype designs of sensor strips for in-socket use. In the long term, processes, material choices and design developed in the project will be put to practical use in our customers' operations also in other sectors. The experience of working in the SocketSense project is valuable for our mission to collect and spread new technology to companies and organizations.

Partner	Initial Exploitation Plan
TU	The research within SocketSense builds on background knowledge of TU within biomechanics and prosthetics. We will seek to protect potential Foreground IP from TU that might arise from the biomechanical models particularly in relation to any correlations between pressure and comfort to reach optimum prosthetic socket shape. TU will also seek to publish in high quality journals and make the work publicly available as well as disseminating information within the relevant conferences. Our work in SocketSense will also be used for educational purposes and will be incorporated within undergraduate and post-graduate programmes. We will pursue academic and commercial opportunities that will expand our knowledge and expertise on biomechanics, prosthetics and sensing.

5.4 Risk Analysis

The risks and potential obstacles for exploitation were identified as well as analysis as to how to address them (Table 14). We further evaluated the likelihood of their occurrence and estimate the impact they might have on the project, and at the same time define actions which could prevent the identified risks. The risks were divided into six categories:

- technological risks
- partnership risks
- market risks
- IPR/Legal Risks
- Financial risks
- Health and Safety/Environmental Risk Factors

Table 14 Risk Analysis

No of risk	Description of Risk	Importance of the risk (1 low- 10 high)	Probability of Risk (1 low- 10 high)	Risk Grade	Scope and type of potential intervention	Feasibility/ success of intervention (1 low- 10 high	Priority Level
Partnership Risk Factors							
P1	Disagreement on ownership rules				• A clear Consortium Agreement has been signed before the project official start date. • The Commercialisation Manager of the project will ensure that all the knowledge generated in the project is managed as agreed in the Consortium Agreement.		
P2	Partners with divergent exploitation interests				• The Commercialisation Manager of the project will monitor and coordinate the exploitation efforts.		
Technological Risk Factors							
T1	The data provided by existing sensors are insufficient (either due to low spatial resolution, or due to limited information e.g. only pressure). Their capability in providing comprehensive dynamic biomechanical data is not proven				• New QTSS sensor assembled from QTSS materials which are anisotropic and give a 'true' pressure/force reading based on the "AREA" of the pressure/force applied to them. They are compatible with open-source software such as Arduino that can measure x, y position and z pressure/force. The QTSS materials will be developed into new sensors specific for the SocketSense project by selecting the most suitable substrates to form the sensor assembly. • New reference scheme for sensor deployment inside socket, allowing the design of intra-socket sensor mapping and qualified data association. • Integration of new AI based methods to assure the quality of measurement data, by coping with the probabilistic aspect of biomechanical behaviours and the uncertainties of measurement. • Enhancement with a new Stewart Manipulator for advanced dynamic testing of SocketSense system performance regarding complex biomechanical behaviours.		

T2	Biomechanical models and algorithms are limited to static test or without considering the change of the soft tissue at various conditions				• New biomechanical models and algorithms will consider all relevant information including changes in soft tissue properties and sensor data over an extended period of time (many weeks or more). A new and optimised socket will be produced automatically without the need for the patient to go to a clinic in advance for diagnosis.		
T3	Socket design practices are highly subjective by a "feel and touch" approach. The quality of service is difficult to guarantee.				• The new SocketSense procedure will be based on quantitative, dynamic, and comprehensive data, hence will lead to reliable results. Clinical trial test will be carried out to validate the whole system. • A new method for 3D modelling of stump and socket for visualisations and virtual rectifications. • A new Decision Support System (DSS) based on a fuzzy-logic inference engine (IE) that allows a more systematic consolidation of prosthetists experience and on biomechanics.		
T4	Software for rapid design of socket based on comprehensive dynamic biomechanical data does not exist				• New software to be developed in the project will integrate various modules in a unified package: soft tissue assessment, sensor data collection and analysis, interactive 3D morphologic adjustment of an existing socket or a new check socket based on the biomechanical analytical model, and the generation of a final definitive socket 3D solid model.		
Market Risk Factors							
M1	Performance of the SocketSystem is lower than the expectations of the end users/market				• Extensive testing of the socket system with end users. Involvement of them during the design process • Examine in detail the features offered by competing technologies.		
M2	Hesitation and risk of new devices usage in diagnosis for critical diseases				• Through validation of the proposed technology, certification, and proper dissemination/ exploitation strategy and user-friendliness of proposed solution will be made sure in the SocketSense project to address this barrier.		

M3	Better technology emerges				• It is foreseen to do updates on the system to improve as more experience is collected.		
M4	Problems at the time if first sales (no or low number of products sold)				• Extensive testing of the socket system with end users. Involvement of them during the design process to prepare for marketing and being able to describe the benefits • Examine in detail the features offered by competing technologies.		
IPR Risk Factors							
I1	Patent applications by the project partners are rejected or it is easy to counterfeit any patents.				• Implement a detailed IP scouting in the early stage of the project to identify the patenting options and establish the optimum way to protect the results. • Identify claims that differentiate the SocketSense IP from “competing” IP • Invite an IP expert in a session.		
I2	Potential IPR dispute among project partners				• Project partners have signed a CA that stipulates the access rights to foreground knowledge created during the project and to background knowledge needed for the research or exploitation of the foreground results. • Discuss in detail the IP strategy among project partners		
Financial Risk Factors							
F1	High Development cost until market introduction				• Demonstrate the financial gains and the market opportunity via a detailed financial model in the business plan.		
Health and Safety/Environmental Risk Factors							
E1	Socket system does not comply with industry/health regulations and standards				• Consult regulation experts and policy makers		

ANNEX 1 – Dissemination Event Report Template

Event	Name of the event
Date	Date of the event
Location of event	City, country and venue where event was held
Consortium Member	Name of the SocketSense Consortium partner organization that participated
Name of individual	Name of individual person from the organization that participated
Role in the event	Presenter, organizer, attendee?
Audience at the event	How many?
	Who was the audience? Types of organizations/people attending.
	☐ Scientific community ☐ Medical professionals ☐ Policy Makers ☐ Investors ☐ Industry ☐ Civil society ☐ Media ☐ Customers
	☐ Others (Please specify):
URL	include URL if it was advertised/promoted
Presentation given (if applicable)	Which presentation did you give? File name or attach file
Responses/feedback	Questions raised; comments/feedback received; Other comments
Ongoing contacts/connections	Has there been any ongoing contacts as a result of this event?
Other comments	Any other comments/notes