AAL

P R O G R A M M E

ANNUAL PROGRESS & FINANCIAL REPORT
– Template –

Please send this report <u>ELECTRONICALLY</u> to the Central Management Unit (CMU) as well as a copy to the National Contact Persons (NCPs) of the coordinator and project partners

The coordinator of the project must submit this report within 60 calendar days after the end of each calendar year, on behalf of the consortium.

If you have any additional question,
please contact the AAL CMU at CMU@aal-europe.eu,
or your NCP (see details on www.aal-europe.eu/aal-ncp)

Report date	01.11.2023
Reported period	This report covers the period from 01/01/2022 to 31/08/2023
Report No.	Indicates if it is the third annual report of the project

<table>
<tr><th colspan="2">PROJECT</th></tr>
<tr><td>Project full title</td><td>Patient centric solution for smart and sustainable healthcare</td></tr>
<tr><td>Project acronym</td><td>ACESO</td></tr>
<tr><td>Project No.</td><td>AAL-2019-6-137 (see list on <u>www.aal-europe.eu</u>)</td></tr>
<tr><td>Project Website</td><td>http://www.citst.ro/projects/aceso/</td></tr>
<tr><td>Project duration</td><td>●   Starting date: 01/05/2020
●   Termination date: 31/08/2023</td></tr>
<tr><td>Coordinator's name and details</td><td>Full name: Centrul IT pentru Stiinta si Tehnologie, Oana Cramariuc
E-mail address: oana.cramariuc@citst.ro
Telephone number: +40 722592570

* Both e-mail address and tel. number must be provided.</td></tr>
</table>

NO.	PARTNER ORGANISATION NAME	PARTNER ORG. ACRONYM	AAL NATIONAL FUNDING AGENCY
PROJECT PARTNERS			
1 (coord.)	Centrul IT pentru Stiinta si Tehnologie	CITST	Executive Unit for Financing Higher Education, Research, development and Innovation (UEFISCDI)
2	SAPHYRION SAGL	SPH	Innosuisse – Swiss Innovation Agency
3	LS DINTIIMEI SRL	LSDM	Executive Unit for Financing Higher Education, Research, development and Innovation (UEFISCDI)
4	Docmatic sp. z o.o	DCMTC	The National Centre for Research and Development (NCBR)

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5	MKS Electronic Systems Ltd	MKS	Ministry of Public Administration (MJU)
6	Jagiellonian University Medical College	JUMC	The National Centre for Research and Development (NCBR)
7	ECLEXYS Sagl	EXYS	Innosuisse – Swiss Innovation Agency
8	Inspiring Culture (Custwell) Ltd	CSW	National Research, Development and Innovation Office (NKFIH)
Please add more lines if required			

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1. ADMINISTRATIVE PROJECT PROGRESS

Report below any changes in administrative aspects of the project, excluding all financial aspects.

CHANGE IN	NO	YES	IF YES: REMARKS/EXPLANATIONS
Duration of the project		X	*THE PROJECT WAS EXTENDED WITH 4 MONTHS AT THE REQUEST OF THE CONSORTIUM*
Consortium composition	X		
Project staff members	X		
Other	X		

2. DELIVERABLES SUBMITTED AND MILESTONES ACHIEVED DURING THE REPORTED PERIOD

Please list below the deliverables and milestones, using the same numbering as specified in the description of work.

In case of deviations from the description of work (work plan) regarding delivery dates, achievement of milestones or changes in planned outputs, please give details, and indicate whether and to whom (AAL NFA/NCP) the changes have been communicated.

DELIVERABLE	DUE DATE	RESPONSIBLE PARTNER	DELIVERY DATE	REMARKS/EXPLANATIONS
D.1.3 PILOT STUDIES WITH THE INTEGRATED PLATFORM	31/07/2023	MKS	31/07/2023	Completed
D.1.4 PRIVACY, SECURITY AND GDPR COMPLIANCE	30/06/2023	CSW	30/06/2023	Completed

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D2.3 PLATFORM SMART FUNCTIONALITIES	30/06/2023	DCMTC	30/06/2023	Completed
D2.4 INTEGRATION OF SMART TOOTHBRUSHES	28.02.2022	CITST	28.02.2022	Completed
D2.5 INTEGRATION OF THE SALIPEN DEVICE	31.08.2022	SPH	31.08.2022	Completed
D2.6 INTEGRATION OF NEW TECHNOLOGIES FOR TSS	30.06.2022	SPH	30.06.2022	Completed
D3.1C FINAL BUSINESS PLAN	31.08.2023	SPH	31.08.2023	Completed
D3.2B REPORTS ON STAKEHOLDER CONCERNS AND DEMONSTRATOR SESSIONS	31.08.2023	CSW	31.08.2023	Completed
D3.4 SCIENTIFIC DISSEMINATION REPORT	31.08.2023	CITST	31.08.2023	Completed
D4.2C CALENDAR YEAR REPORT	31.08.2023	CITST	31.08.2023	Completed
D4.5 FINAL PROJECT REPORT	31.08.2023	CITST	31.08.2023	Completed

MILESTONE	DUE DATE	RESPONSIBLE PARTNER	ACHIEVEMENT DATE	REMARKS/EXPLANATIONS
M.S4 INTEGRATED SALIPEN AND TSS READY TO INTRODUCE IN T1.3 ON-GOING PILOTS	30/04/2022	SPH	30/04/2022	Reached

3. SCIENTIFIC/TECHNICAL PROJECT PROGRESS TO DATE

Please check appropriate box:

The project ☒ is in line with (or) ☐ deviates from the valid description of work (version/date: January 2023)
In the case of deviation, please explain how and why:

Provide a summary of developments since the last report, including:
- *The performance of the project consortium*
- *Technical achievements*
- *End-user services*

The performance of the project consortium: The consortium as a whole has performed as a team in addressing the project tasks. Online meetings and a final hybrid meeting (Krakow, 27.07.2023) were held in order for the project partners to coordinate on the project implementation. In total, 25 meetings were held during the reporting period. The partners have actively participated in the meetings and in the tasks assigned to them. Some delays were however experienced which were recovered via the project extension.

Technical achievements:

1)   AI smart functionalities for the ACESO toothbrush

The performed technical and metrological analysis of devices involved in recording the toothbrushing process and the data streams allowed for determining the optimal sampling frequency that retains

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information about possibly high-frequency components of brushing movements within the technical capabilities of all used sensors, as well as the conditions for resampling sequences from external data sets. Subsequently, the focus was on formulating the predictive problem and preparing its solution using machine learning methods. In the next phase, the construction of models based on deep neural networks began, testing different architectures with various parameters. The prepared model was embedded in an analytical microservice exposing a typical RESTful API interface and implementing additional post-processing and interpretation stages of model predictions.

2)   ML and data analytics

An analysis of the measurement capabilities and data structure of ACESO devices and solutions was conducted, identifying a set of key parameters subject to automatic processing, such as body weight, blood pressure, pulse, saturation, blood sugar, physical activity, and tooth brushing quality.

Subsequently, the focus was on selecting analytical techniques most suitable for presentation and interpretation dedicated to patients and their caregivers.

The developed solution was further enriched with a module for formulating automatic interpretative messages. For this purpose, possible approaches were considered, both passive and active, straightforward and inverted, differing in formulation structure, to choose the variant most consistent with the colloquial understanding of causality and the ability of a patient to consciously influence their health status.

The constructed models and mechanisms for interpreting predictions were finally encapsulated in a RESTful API interface and implemented as a service.

The caregiver interface was implemented - the caregiver can visualize the health and oral health parameters for each user; in case of missing measurements or abnormal values a message is sent to the user through the interface.

3)   Integration of smart toothbrushes

First version of the ACESO toothbrush used a manual toothbrush that was incorporated into a handle developed by CITST. However, the user could not change the toothbrush because it was glued to the handle. A new version of the handle has been designed that can be used with an interchangeable head from electric toothbrushes. The shape of the toothbrush handle was updated in order to have an ergonomic aspect. After printing, the surface of the handle was post-processed using specific technologies in order to obtain a surface of superior quality (visually as well as from the point of view of texture). The cup was modified to drain the water after using the toothbrush. In order to avoid demagnetization (the impossibility of using the cup for detection of the beginning and ending of the brushing) of the magnetic tape from the cup, the design of the cup was updated and three magnets were placed on the bottom of the cup. The ACESO interface was updated in order to show graphs of the brushing duration and brushing history.

4)   Integration of SaliPen

To create the intelligent SaliPen, a 3D cup was designed by adding an electronic circuit on the vase of the cup in order to detect the presence / absence of the device in the cup. An Android application was also developed for saving data from the SaliPen into the ACESO database. After testing, an updated

version of the cup was made - the shape of the cup was modified to eliminate errors in detection of the device. Also, the ACESO Portal was updated in order to show graphs of duration of usage.

5)   Integration of TSS

We have combined experimental evidence with literature and patent search in order to propose two approaches for salivary stimulation which are easy to use and also reduce the discomfort and hygienic risks reported for intraoral devices. The first approach is based on an addition to the ACESO toothbrush which allows chemical stimulation via a solution placed in a reservoir and pumped through the head of the toothbrush. It also allows monitoring of usage via same implementation as the one in the ACESO smart toothbrush. The second prototype is based on TSS via TENS and local heating. The device should be worn on the head in such a way as to allow two pairs of electrodes to be placed on the skin, at the level of the salivary glands.

6)   End-user services

CITST short description of the Romanian pilots and conclusions

20 primary users were involved in the Romanian pre-pilots implemented by LSDM with the technical support from CITST. Ten secondary users (6 stomatologists, 4 dental assistants) were involved in the pre-pilots. Most of the users considered that the devices and the ACESO interface are easy to use, comfortable and intuitive. The only exception to this rule was considered the SaliPen, which was seen as difficult to use by the secondary users. All users agreed that it is very useful that the recorded data (from the devices) is transmitted to the tablet and made visible on the interface in the form of plots where both current and past data is shown. Participants generally believed that this feature is useful both for self-monitoring at home and for their doctor monitoring their health status.

A total of 10 primary users and 7 secondary users (four dentists, one dental assistant, one orthodontist, one generalist physician) were enrolled in the second round of Romanian pilots. All of them complied with the inclusion and exclusion criteria. The primary users in Romania were patients of the dental office LS DINTIIMEI SRL, aged over 64, with different dental statuses that require prosthodontic treatment, from fixed rehabilitation to removable rehabilitations. Out of the 10 participants, 2 dropouts were registered, the main reason for this being 'the complex nature of the ACESO platform'. Participants had a positive opinion concerning the overall experience with the ACESO platform and its devices. The interface was considered intuitive and facile to navigate, the different sections of the platform were seen as easy to find, the graphics were seen as very useful for the seniors, their caregivers and medical staff alike. The login and logout activities were considered accessible with the use of the NFC tag. Several participants mentioned that the platform is useful for keeping their health issues in check.

JUMC short description of the Polish pilots and conclusions

The pre-pilots in Poland were conducted with 20 primary users (seniors 60+) and 15 secondary users (5 dentists and 5 oral hygienists, 5 geriatricians). The devices used for the ACESO platform were considered by most of the participants very easy to use, very comfortable and very intuitive, while the ACESO interface led to divided opinions: half of the users considered it difficult to use and non-

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intuitive. The secondary users had a similar problem with the smart toothbrush, almost half of them considering it non-intuitive.

During the second round of Pilots, with the integrated ACESO platform, JUMC included 10 primary and 5 secondary (professional) users. The latter included one dentist, 2 geriatricians, and 2 residents in internal medicine. In line with the midterm review, the real-life approach of giving more weight to the non-dental healthcare professionals was followed. All participants met the inclusion criteria.

All participants finished the 6 months program of testing, however, due to the naturalistic nature of the pilots, some end-users had spells of non-usage due to travel. In the case of two participants, poor compliance led to the lack of final dental assessment. As per the GCP rules, we are striving to perform the assessment even after the closure of the follow-up period. In general, the integrated platform was well received by the users. Of the various functionalities, as indicated in their answers to the SUS questionnaire, the intelligent brush, integrated blood pressure measuring device and weighing scales were the most appreciated measurement modalities. Of note, the possibility to send feed-back to the end-users by the professional caregivers turned out to be an important feature. On average the feed-back was sent every two weeks, and included dental and general medical advice based on the performance available in the caregiver interface of the system. In the case of two participants, their blood pressure values were too high, which prompted appropriate feed-back. This in turn has led to the recall of the patient to the appropriate outpatient clinic, adjustment of the medications and improvement in the blood pressure control. This, in itself, is a case-study in the usability and potential clinical efficacy of the ACESO platform.

The end-users gave informative feed-back concerning the system itself. Although on one hand they did not consider the system to be overly complicated, they pointed to the issues that at the stage of pilots made the daily use cumbersome. These included problems with connectivity, especially touching the activity bands. The brush connectivity problems reported early-on, were resolved by the technological partners by redesigning the brush cup. In the case of two individuals with recent dental procedures the dental assessment revealed the need for even more dedicated brushing. The reassuring message was given to the patient by the study dentist.

MKS short description of the Slovenian pilots and conclusions

The Slovenian pre-pilots involved primary participants recruited through the MKS patient network, the older adults that regularly participate at testing activities of the living-lab. The secondary users were recruited through the health care professional network of MKS. There were 20 primary users and 10 secondary users involved in the pre-pilots.

Most participants (over 70%) considered both the devices and the ACESO interface easy to use, comfortable and intuitive. They were pleased by the possibility of sharing their medical parameters directly with their medical professionals. Secondary users gave similar answers.

For the pilots with the integrated platform, primary users in Slovenia were patients of the dental office in Ljubljana and several families outside of Ljubljana, in the city of Koper, and in the rural area around Ljubljana. A total of 20 primary users were enrolled in the Slovenian pilots. The secondary users were 10 and they had adequate professional profiles: dentist, dental assistants, nurses, hygienists and general doctors.

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There were several great recommendations for improvement and upgrade of the ACESO solution. The creation of a video tutorial for patients and for medical staff with regard to the employment of the ACESO platform was an outstanding idea, which could be implemented in the future. The improvement of the connection between the medical devices and the platform was proposed, as primary users sometimes had problems with this. Furthermore, the addition of sleep monitoring was requested by several seniors. From the secondary users, an interesting idea was the inclusion of tips and tricks for the seniors, to better take care of their health.

All of the primary end users would like to use the platform in the future and would also recommend the platform to other users. In regards to the secondary users, when asked if they would like to use the ACESO platform in the future, all of the respondents agreed that they would like to use the ACESO platform and all of the solutions in the future. Also, when asked if they would also recommend the ACESO platform to their work colleagues, informal caregivers and the elderly, 100% agreed that they would recommend the ACESO platform to their patients or the patients of their colleagues or to the use of the elderly in general.

#	Date	Details	Participants
		How many consortium meetings were held during the period covered by this report?	
1	12.01.2022	Discussions of the midterm input and future actions	All
2	26.01.2022	End-user issues and business aspects	All
3	02.02.2022	End users & technical & business meeting	All
4	16.02.2022	End users & technical & business meeting, advisory board invitation	All
5	02.03.2022	End users & technical & business	All
6	30.03.2022	Technical	SPH, EXYS, CITST, DCMD
7	06.04.2022	Business	SPH, CITST, MKS, LSDM, CSW
8	27.04.2022	End users & technical & business	All
9	11.05.2022	End users & technical & business	All
10	01.06.2022	Business	SPH, CITST, MKS, LSDM, CSW
11	22.06.2022	End users & technical & business	All
12	31.08.2022	End users & technical & business	All
13	21.09.2022	End users & technical & business	All
14	19.10.2022	End users & technical & business	All
15	23.11.2022	End users & technical & business	All
16	14.12.2022	Applying for extension	All
17	20.01.2023	Business aspects in Romania	CSW, LSMD, CITST
18	08.02.2023	End users & technical & business	All

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19	08.03.2023	End users & technical & business	All
20	05.04.2023	End users & technical & business	All
21	16.05.2023	End users & technical & business	All
22	31.05.2023	End users & technical & business	All
23	21.06.2023	Business	SPH, CITST, MKS, LSDM, CSW
24	27.07.2023	Hybrid consortium meeting in Krakow	All
25	16.08.2023	Preparation for the final reporting	All

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4. IMPACT AND AWARENESS ACTIVITIES

PLEASE INDICATE IF THE PROJECT WILL PRODUCE/ACHIEVE OR HAS PRODUCED/ACHIEVED ANYTHING OF SPECIAL INTEREST FOR THE AAL JP (E.G. A PROJECT EVENT, PRESS RELEASES, PUBLICATIONS, PATENTS, DEMONSTRATORS, ETC.).

Project participant responsible (indicate country)	Activity	Date	Medium and reference (press, event, newsletter, webpage, etc.)	Indicative coverage
LSDM, CITST	Presentation, demonstration and stakeholder discussion of the projects's results during an event organized at the "Academician Nicolae Cajal Home for the Elderly"	04/04/2022	Demonstration, presentation, promotional materials	60
CITST	https://identevolution.ro	27-29/04/2022	Promotional materials and stakeholder discussions	100
CITST	Techweek Bucharest	17-19/06/2022	Promotional materials and stakeholder discussions	250
CITST	BeHEALTH 2022	25-27/10/2022	Oral presentation	500
All partners	AAL forum organized during the European Week of Active and Healthy Ageing	18-21/10/2022	Promotional materials	150
CITST, SPH, CSW	Presentation of the project results and stakeholder discussions with the Alphasigma company which is one of the largest companies of oral hygiene and oral health products	22/11/2022	Presentation and demonstration to stakeholders	10

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CITST	A-WEAR workshop held at Tampere University in Finland in February 2023	CITST	Presentation	50
CITST	Presentation and demonstration of the ACESO project at Nichita Stanescu High School in Bucharest (April 2023).	14/04/2023	Presentation	30 students of the 10th grade and teachers of the school took part in the week.
CITST	COST Action Network on Privacy-Aware Audio- and Video-Based Applications for Active and Assisted Living (COST Action CA19121 GoodBrother)	13-16/06/2023	Presentation	70
CITST, LSDM	Presentation and demonstration of the ACESO project at the Centre of Excellence in Care for the Elderly and Prevention of Memory Disorders Vitalitas	23/06/2023	Presentation and demonstration to stakeholders	10
CITST, LSDM	Ligia Muntianu, Platforma electronica dental e-care in proiectul European ACESO [The electronic e-care dental platform in the European ACESO project], Conferinta de paro-protetica a AMSPPR 2022, 3-5 March, online presentation.	3-5.03.2022	Presentation	200
CITST, LSDM	Ligia Muntianu, Inteligenta artificiala in ingrijirea sanatatii orale si generale [Artificial intelligence in oral and general health care], Conferinta de paro-protetica a AMSPPR 2022, 3-5 March, online presentation.	3-5.03.2022	Presentation	200

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CITST, CSW	Webpage		www.aal.aceso.eu	1
CSW CITST	22 blogs published		https://www.aal-aceso.eu/blog	179
EXYS	Presentation and demonstration of the project to stakeholders in the south region of Switzerland	23/06/2023	Presentation to stakeholders	14
JUMC	Poster presentation during the 2022 Congress of EuGMS, London, UK - largest annual conference on geriatric medicine in Europe	28-30/09/2022	Presentation/Presentation to stakeholders	1500
JUMC	Teledentistry and oral health in older adults — aspects for implementation of the "Patient centric solution for smart and sustainable healthcare (ACESO)" project authors: BARBARA GRYGLEWSKA1,2, IAN PERERA2, EWA KLIMEK1,2, MAŁGORZATA FEDYK-ŁUKASIK1,2, KAROLINA PIOTROWICZ1,2, IRINA MOCANU3, LIGIA MUNTIANU4, JERZY GĄSOWSKI1,2* FOLIA MEDICA CRACOVIENSIA Vol. LXII, 2, 2022: 5–16 PL ISSN 0015-5616 DOI: 10.24425/fmc.2022.141697	2022	Journal article	500

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JUMC	Kierunki rozwoju telemedycyny w geriatrii (Directions of telemedicine's development in geriatrics), authors: Anna Rudzińska1, Robert Kupis2, Karolina Piotrowicz3, Łukasz Malicki4, Irina Mocanu5, Oana Cramariuc6, Ian Perera7, Barbara Gryglewska8, Jerzy Gąsowski9 in: Oczekiwania wobec nauk biomedycznych –trendy, wyzwania i perspektywy. red. pp147-159, Lublin 2023. ISBN 978-83-67104-73-9	2023	Publication in a collection of monographs	500
JUMC	Presentation to medical students during a seminar covering geriatric assessment and the approach to the patient, JUMC.	28/04/2023	Presentation to stakeholders/ Reaching out towards new generation of stakeholders and professional end-users	15
MKS	Presentation to doctoral students and committee for doctoral studies	June 25 – June 28, 2023	36th Bled eConference DIGITAL ECONOMY AND SOCIETY: THE BALANCING ACT FOR DIGITAL INNOVATION IN TIMES OF INSTABILITY June 25 – June 28, 2023	Bled, Slovenia	50

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MKS	Presentation to doctoral students and committee for doctoral studies	22. - 24. marec 2023 |	42. konferenca o razvoju organizacijskih znanosti INTERDISCIPLINARNOST ŠTEJE 22. - 24. marec 2023 | Portorož, Slovenija	35
MKS	Presentation to companies and start-ups	13.12.2022	Technology Park Expert meeting - Tehnološki park Ljubljana 13.12.2022	60
MKS	Presentation to decision makers (Ministry of Health, Ministry of Digital transformation), colleagues, experts and companies, researchers	10. in 11. november 2022	International congress Society for Medical informatics Kongres MI'22 z mednarodno udeležbo Odločno digitalno za več zdravja 10. in 11. November 2022	350
MKS	Presentation to colleagues, experts, companies and researchers	January - June 2023	Series of International Webinars in co-organisation with ISfTeH - SATS and IZRIIS	280

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CSW	2022 CEE4Impact day conference on Impact investment	14.10.2022	https://www.thbe.hu/cee4impact-day-save-the-date/ https://thbe.hu/konferencia	200
CSW	2023 CEE4Impact day conference on Impact investment	16.10.2023	https://www.thbe.hu/cee4impact-day-save-the-date/ https://thbe.hu/konferencia	180
CSW	Online presentations on Aceso to potential partners	2022-2023		
CSW	Meetings at Ujbuda Social Service, municipality elderly care on possible use of Aceso	2022-2023	https://uszosz.ujbuda.hu/	Taking care of 40.000 adults
CSW	Meeting on Aceso oral hygiene module at Medistance	11.09.2023	https://medistance.eu/	3

5. OTHER COMMENTS

Report below any other issue or comment (optional)

(your text here)

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DO NOT FORGET TO FORWARD ALL UPDATES OF OFFICIAL PROJECT DOCUMENTS (E.G. DESCRIPTION OF WORK, CONSORTIUM AGREEMENT, ETC.) TO THE AAL CENTRAL MANAGEMENT UNIT AND NCP OF THE COORDINATOR AND PROJECT PARTNERS.

6. HUMAN RESOURCES REPORT

PROJECT PERSON EFFORT DURING THE REPORTING PERIOD			
PARTNER ORG. ACRONYM	*Actual* effort in person/ months for the reporting period	*Planned* effort in person/ months for the reporting period	**Remarks**
1. CITST	17.20PM	14.50PM	4 months extension
2. SPH	30PM	30PM	
3. LSDM	10.90PM	9.90PM	
4. RFC	12,39PM	14,75PM	A portion of the costs that were budgeted as personnel costs in the grant proposal has been moved to the subcontracting category.
5. MKS	11,7 PM	11,7 PM	
6. JUMC	30 PM	21 PM	
7. EXYS	33 PM	30 PM	
8. CSW	66,80 PM	32,25PM	project extension, underestimation of the tasks and administration to be performed, and internalized tasks instead of outsourcing
TOTAL	199.6 PM	164.1 PM	

Please add more lines if required

ADDITIONAL INFORMATION
Please check appropriate box: ***The financial progress of the project*** ☒ ***is in line with (or)*** ☐ ***deviates from the partner's Grant Agreements & Work Packages plans*** (personal efforts, other costs, etc)***?*** ***In case of deviation, please explain how and why:***
Have you encountered or do you foreseen any financial difficulties for the project realisation (e.g. payments, additional costs, other)?
If yes, please explain. CSW - Project liquidity problems due to delays in transfers. (MKS) The difficulty for MKS as a micro R&D company were delays in reimbursement of the project costs, which lasted up to 18 months (payments by AAL over 12 months after financial claims).
Do you want to make any other comments in relation to the financial aspects of the project?
If yes, please explain.

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