ASCAPE

Artificial intelligence Supporting CAncer Patients across Europe

Project Title	Artificial intelligence Supporting CAncer Patients across Europe
Project Acronym	ASCAPE
Grant Agreement No	875351
Instrument	Research and Innovation action
Call / Topic	H2020-SC1-DTH-2019 / Big data and Artificial Intelligence for monitoring health status and quality of life after the cancer treatment
Start Date of Project	01/01/2020
Duration of Project	36 months

D5.2 – Communication, dissemination, impact creation, exploitation, and standardisation report

Work Package	WP5 – Dissemination, Exploitation and Legal monitoring
Lead Author (Org)	John Avramidis, Christina Stratigaki (UBI); Manuel Perez, Ana Belén González (ATOS)
Contributing Author(s) (Org)	ALL partners contributed
Due Date	30.06.2021
Actual Date of Submission	06.07.2021
Version	1.0

Dissemination Level

X	PU: Public (*on-line platform)
	PP: Restricted to other programme participants (including the Commission)
	RE: Restricted to a group specified by the consortium (including the Commission)
	CO: Confidential, only for members of the consortium (including the Commission)

The work described in this document has been conducted within the project ASCAPE. This project has received funding from the European Union's Horizon 2020 (H2020) research and innovation programme under the Grant Agreement no 875351. This document does not represent the opinion of the European Union, and the European Union is not responsible for any use that might be made of such content.

Versioning and contribution history

Version	Date	Author	Notes
0.1	25.03.2021	John Avramidis (Ubitech)	ToC
0.2	25.05.2021	John Avramidis, Christina Stratigaki (Ubitech)	First draft of Sections 2,3,4,5,6.
0.3	05.06.2021	Perez, Manuel Marcelino (ATOS)	First draft of Sections 7,8,9
0.4	15.06.2021	Perez, Manuel Marcelino (ATOS), All partners	Exploitable assets, exploitation strategies. First complete draft
0.5	20.06.2021	John Avramidis (Ubitech)	Final draft
0.6	24.06.2021	John Avramidis (Ubitech), Perez, Manuel Marcelino (ATOS).	Comments addressed
0.7	27.06.2021	Christina Stratigaki, John Avramidis (Ubitech), Perez, Manuel Marcelino (ATOS).	Refine Exec. Summary and Conclusions
0.8	28.06.2021	John Avramidis, Christina Stratigaki (Ubitech)	Final draft
0.9	02.07.2021	Lucian Mihai (Siemens), Christina Stratigaki (Ubitech)	Review
1.0	05.07.2021	John Avramidis (Ubitech), Perez, Manuel Marcelino (ATOS).	Comments addressed
1.1	06.07.2021	John Avramidis, Christina Stratigaki (Ubitech)	Final document

Table of Contents

Executive Summary *7*

1 Introduction *8*

1.1 Purpose of the document 8

1.2 Document outlines 8

2 Dissemination and communication methodology *10*

2.1 Dissemination strategy 11

2.2 Dissemination objectives 12

2.3 Target audiences 13

2.4 Key messages 13

2.5 Communication contributors 13

2.6 Roadmap 14

3 Communication & Dissemination channels *15*

3.1 Offline channels 15

3.1.1 ASCAPE project events 15

3.1.2 External events 16

3.1.3 Synergies 22

3.1.4 Publications 23

3.2 Online channels 25

3.2.1 ASCAPE website 25

3.2.2 ASCAPE social media 27

3.2.3 External Media coverage 30

4 Communication & Dissemination tools *32*

4.1 ASCAPE informational material 32

4.1.1 Brochure 32

4.1.2 Posters 33

4.2 ASCAPE Digital material 35

4.2.1 Press releases 35

4.2.2 Newsletter 35

4.2.3 Videos 38

5 Communication and Dissemination assessment *39*

6 ASCAPE exploitation *41*

6.1 Introduction 41

6.2 eHealth services for managing breast and prostate cancer patients 42

6.3 Artificial Intelligence (AI) services for managing breast and prostate cancer patients. 43

6.4 ASCAPE Value proposition 43

6.5 ASCAPE The vision 45

6.6 ASCAPE The mission 45

6.7 ASCAPE The business offerings 46

6.8 SWOT analysis 47
6.8.1 Strengths 47
6.8.2 Weaknesses 48
6.8.3 Opportunities 48
6.8.4 Threats 48

6.9 Possible exploitation strategies 49

6.10 ASCAPE: Individual Identified Assets 50
6.10.1 Simulation software by DFKI 51
6.10.2 Explainable AI by DFKI 52
6.10.3 Fitbit Data Adapter by Ubitech 54
6.10.4 Weather Data Adapter by Ubitech 55
6.10.5 Edge AI Models Manager by UNSPMF 56
6.10.6 Cloud Federated Learning Coordinator by UNSPMF 57
6.10.7 ASCAPE AI Knowledge Manager by UNSPMF 58
6.10.8 Edge AI Prediction and Simulation Manager by UNSPMF 59
6.10.9 Health Suite by Atos 63
6.10.10 Method for operating on encrypted data by Siemens. 66
6.10.11 ASCAPE Dashboard by INTRA 68
6.10.12 ASCAPE Visualisation Library by INTRA 70
6.10.13 ASCAPE Device Data Synchroniser by INTRA 72
6.10.14 ASCAPE Data Enricher by INTRA 73

6.11 Individual exploitation plans, sustainable expectation, and interests 75
6.11.1 UBITECH individual exploitation plans and sustainability expectations. 75
6.11.2 Atos individual exploitation plans and sustainability expectations. 78
6.11.3 DFKI individual exploitation plans and sustainability expectations. 80
6.11.4 NKUA individual exploitation plans and sustainability expectations 82
6.11.5 CAREACROSS Individual Exploitation Expectations and Interests 85
6.11.6 ALBV Individual Exploitation Expectations and Interests 89
6.11.7 INTRA Individual exploitation, sustainability expectations and Interests 93
6.11.8 UNSPMF Individual exploitation, sustainability expectations and Interests 97
6.11.9 FORTH Individual Exploitation Expectations and Interests 100

7 IPR management 103
7.1.1 Ownership of the results 103

7.2 Intellectual property registry 103

7.3 Protection and use of the results 104

7.4 Revision of Open Sources Licenses 105

7.5 Legal framework 108

8 Standardisation 109

8.1 Standardization approach and objectives 109

8.2 Standardization groups 109

9 Conclusions 111

10 References 112

List of tables

Table 1 Communication vs Dissemination 10
Table 2 Lasswell's Communication model 11
Table 3 ASCAPE website cumulative analytics 27
Table 4 ASCAPE Twitter analytics 27
Table 5 ASCAPE LinkedIn analytics 29
Table 6 Communication and Dissemination Key Performance Indicators 39
Table 7 Selected e-health applications focused on supporting cancer patients QoL issues. 44
Table 8 Resulting options from the SWOT analysis. 50
Table 9 Simulation description 51
Table 10 Explainable AI description 52
Table 11 Competitors and Trends 53
Table 12 Fitbit Data Adapter description 54
Table 13 Weather Data Adapter description 55
Table 14 Edge AI Models Manager description 56
Table 15 Cloud Federated Learning Coordinator description 57
Table 16 ASCAPE AI Knowledge Manager description 58
Table 17 Edge AI Prediction and Simulation Manager description 60
Table 18 Competitors and Trends 61
Table 19 Health Suite description 63
Table 20 Competitors and Trends 64
Table 21Simple Encrypted Arithmetic Library description 66
Table 22 Competitors and Trends 67
Table 23 ASCAPE dashboard description 68
Table 24 ASCAPE Visualization Library description 70
Table 25 ASCAPE Device data Synchronizer description 72
Table 26 ASCAPE Data Enricher description 73
Table 27 UBITECH Exploitation plan 75
Table 28 ATOS exploitation plan 78
Table 29 DFKI Exploitation plan 80
Table 30 NKUA Exploitation plan 83
Table 31 CAREACROSS exploitation plan 85
Table 32 ALBV Exploitation plan 90
Table 33 INTRA Exploitation plan 93
Table 34 UNSPMF Exploitation plan 97
Table 35 FORTH Exploitation plan 100
Table 36 List of most common licenses used 106

List of figures

Figure 1 ASCAPE diffusion of innovation model 12
Figure 2 Snapshot of ASCAPE 1st Awareness workshop 16
Figure 3 ASCAPE presentation at 2020 TechMed 18

Figure 4 ASCAPE account on ClinicalTrials.gov 25
Figure 5 ASCAPE website traffic - 2020 26
Figure 6 ASCAPE website traffic - 2021 26
Figure 7 ASCAPE Twitter account 28
Figure 8 ASCAPE LinkedIn company page 29
Figure 9 ASCAPE Facebook page 30
Figure 10 Interview on “The Future of Healthcare” portal 31
Figure 11 ASCAPE brochure 32
Figure 12 ASCAPE poster at IDA2021 33
Figure 13 ASCAPE poster at 2020 San Antonio Breast Cancer Virtual Symposium 34
Figure 14 ASCAPE poster at 27th Hellenic Conference of Clinical Oncology 34
Figure 15 ASCAPE 1st newsletter - 1/2 36
Figure 16 ASCAPE 1st newsletter - 2/2 37
Figure 17 ASCAPE's YouTube channel 38
Figure 18 Screenshot of the IPR inventory of the project 104
Figure 19 IPR scheme of different protection and licences based. 105

List of acronyms

Acronym	Full Name
QoL	Quality of Life
BAALL	Bremen Ambient Assisted Living Lab
EHRs	Electronic Health Record
AI	Artificial Intelligence

Executive Summary

ASCAPE project is investing a lot of effort on the impact of its developments on stakeholders outside the project. Based on the importance of this goal, we planned from early on communication, dissemination and exploitation activities that will be continued well after the project's conclusion.

In this deliverable, we discuss different dissemination and exploitation strategies, which cover objectives such as supporting the development of the ASCAPE framework, receiving feedback and support activities including external and digital campaigns to reach out to large target audiences. We also discuss all the respective activities took place during the last 18 months such as (i) publication of newsletters and brochure, (ii) scientific publications, (iii) presentations in conferences and workshops (iv) organisation of ASCAPE events (v) use of the ASCAPE website and social networks, and finally, (vi) synergies with other H2020 projects together with evaluation of those actions.

For the exploitation part we have also rolled out the individual artefacts that are deemed as exploitable by the partners, and we establish the related Intellectual Property Rights policies which the partners will use as a guide to protect their assets. In addition, we elaborate on an initial market analysis for breast and prostate cancer and demonstrate the project's value proposition and business opportunities for our products. Last, we unfold possible commercialization strategies to bring them closer to the market and analyse the standardization landscape in which ASCAPE solution places itself.

We consider this document to be a living one as the project evolves since respective activities need to serve the communication, dissemination and exploitation needs of the partners and external stakeholders in an ad-hoc way. Besides, as the project evolves, the consortium will deepen on potential impacts of ASCAPE results and work on agreements for the joint exploitation of the platform. Different business plans will be investigated to finally define the roadmap for successful exploitation of ASCAPE results.

1 Introduction

ASCAPE is a Horizon 2020 project that is developing a novel AI-based platform that will allow physicians to monitor and propose interventions that will improve Quality-of-Life factors which are critical for breast and prostate patients after treatment. To this end, ASCAPE uses a bundle of tools to deal with patients' data collection and analysis, machine learning model training and inference, and security and privacy. Thus, through this deliverable and communication, dissemination, and exploitation activities we are paving the way to spread the word about ASCAPE, make known the impact that our research will have on the life of cancer patients and the healthcare practices, as well as secure the sustainability of the generated results in the future through different available routes.

In any case, dissemination, and exploitation of projects outcomes to identified stakeholders and the public, are an inherent part of Horizon 2020 projects as a contractual obligation posed by the grant agreement.

1.1 Purpose of the document

The WP5 efforts, under Tasks 5.1 and 5.2, commenced after the project announcement and continued throughout the last 18 months by diffusing the ASCAPE activities and outcomes and preparing for their future utilisation. Hence, this period was crucial concerning the awareness activities since we had to establish the project in the eyes of targeted audiences in relation to our vision and objectives, and to create a targeted awareness of ASCAPE technologies to prospect users. All of our actions targeted at (i) ensuring the impact of our research through maximising stakeholders' awareness and involvement through the organisation and participation of the project in various types of events, and publications (ii) taking advantage of mainstream and digital communication tools (iii) communicating the project's key messages and news in a clear language, and (iii) evaluating and adjusting these activities were deemed necessary.

From the exploitation aspect, our goals were to (i) analyse the market landscape and business opportunities that ASCAPE will have to take advantage of in order to create monetary value, (ii) chart all the identified artefacts that are going to be created and roll out a plan to exploit and protect it, (iii) define the consortium's commonly agreed rules to manage antecedent and project-generated know-how and results as well as the mechanisms to safeguard the results produced, and finally, (e) lay the foundations of a strategy to guide the exploitation of ASCAPE results in the medium and long term.

1.2 Document outlines

As a first step, we set out the methodology used to determine the followed strategy. In that regard, we are stating our objectives, key messages, the contribution of partners,

the targeted audiences identified and a detailed time plan. The next chapter is dedicated to the usage by the ASCAPE of offline and online channels to create awareness, such as conferences, workshops, webinars, websites, and social media. Moving on, we refer to the use of tools that also contributed in parallel to our campaigns like brochures, posters, and videos to eloquently promote ASCAPE. Closing the communication and dissemination part, we assess the KPI's set from the begging of the project.

Section 6 provides an overview ASCAPE of the landscape and the potential role of AI in breast and prostate cancer-related applications. Based on this, we develop our value proposition (alongside a comprehensive assessment of it) and the business offerings to the targeted market. In the same section, we lay down possible exploitation strategies and the partners' individual plans. Section 7 introduces a list of policies with regards to Intellectual properties rights management on how to handle such issues. Finally, Section 8 is dealing with legal considerations that underpins the acceptance of the Open AI framework and our standardization approach that will facilitate the adoption of the ASCAPE.

2 Dissemination and communication methodology

Communication holds an integral part in research projects, as it is most often associated with their success or failure. In this spirit, ASCAPE Action designed and implemented a plan for the management of its communication and dissemination activities. Before referring to those activities, it would be useful to provide a precise definition of "communication" and "dissemination" based on the guides provided by the European Commission to avoid any misinterpretations that could create ambiguity regarding the strategy and the messages we want to pass on to the project partners and stakeholders:

Communication: is considered as a planned process that starts at the beginning of the action and continues throughout its entire lifetime, aimed at promoting the action itself and its results. It requires strategic and targeted measures for communicating about (i) the identity and the objective of the project and (ii) its results to a multitude of audiences, including the media and public and possibly engaging in a two-way exchange. One of its basic goals is to reach society as a whole and showcase how EU funding contributes to addressing social challenges.

Dissemination: Dissemination means sharing research results with potential users (peers in the research field, industry, other commercial players, and policymakers) by any appropriate means (e.g., scientific publications) other than protecting or exploiting them. In this sense, the transfer of knowledge and project results with the scientific community can contribute to maximizing the impact of research, allowing the more extensive spreading of results and the progress of science in general.

Table 1 Communication vs Dissemination

	Communication	Dissemination
Focus	About the project & results	About results
Target audience	Multiple audiences (including media and public)	Direct users of the results (e.g., peers, industry, commercial actors, organisations, policymakers)
Objectives	Inform & be in touch with society, explain the benefits of the research	Facilitate the adopting and use the results
Timeframe	Starts at Day 1	As soon as results are available but mainly towards the second half of the project

2.1 Dissemination strategy

The ASCAPE communication model relies heavily on the Lasswell model, which adapts to the age of digital media (in terms of interaction between the communication operator and stakeholders) to avoid any rigidity. This model introduces five components (also known as the 5W model) that are fundamental elements in the field of mass communication process. According to this, there is an easy and simple way to organize a successful communication campaign to answer the following: who says what, on which channel, to whom and with what result.

Table 2 Lasswell's Communication model

	Meaning	Action to be taken
Who	Communicators/source of the messages	Control analysis (Communication leader/partners)
Says what	Content of message	Key messages development
In which channel	vector of the message	Analysis of available channels
To whom	Receiver/audience of the message	Stakeholders' analysis
With what effect	Feedback from the receiver to the sender/assessment	Feedback analysis

Since we aspire to exploit the new technologies developed under ASCAPE and communication plays a vital role in in this process, we operationalised the above-mentioned framework with the McGuire's persuasive communication model and diffusion of the innovation model[1] where innovations are passed channels over time and within a specific social environment. This innovation model is described in the deliverable D5.3, and here are listed only its basic elements to determine digital health innovation adopting or rejection: (i) The characteristics of innovation, (ii) The characteristics of the target groups, (iii) Social environment aspects.

[1] Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations (pp. 432-448). Routledge.

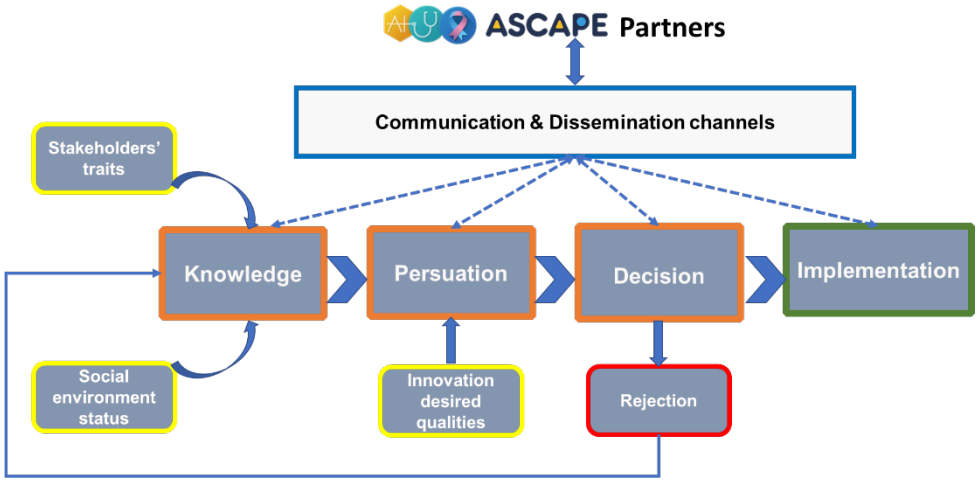


Figure 1 ASCAPE diffusion of innovation model

2.2 Dissemination objectives

Communication and dissemination of ASCAPE are also important for the effective promotion of exploitation activities. In this context, the measures to maximize the impact of the project include a thorough strategy described above that will steer all communication and dissemination activities from the early stages of the project. The aim of this plan is:

Increase visibility: From day one of ASCAPE our goal was to present different aspects of the work to different stakeholders and differentiate ASCAPE from related projects by projecting its unique value proposition. This makes the related activities even more effective and at the same time we reach out to interested groups at the highest level of influence.

Make our activities understandable: ASCAPE is a project that uses state-of-the-art technologies with high standards in the fields of Artificial Intelligence, Machine Learning, Big Data, and of course cancer research. Based on our overall goals, ASCAPE outcomes have the potential to affect the quality of life of many cancer survivors who need to understand how the success of this project can help them improve their daily lives in practice. As a result, we want to convey messages in clear, accessible language, avoiding technical terminology.

Encourage participation of external parties: ASCAPE aims to share project results with relevant stakeholders outside the consortium. Even more, the communication and dissemination actions focus on the validation and extension of our results through specially designed events with the participation of dedicated stakeholders.

2.3 Target audiences

ASCAPE stakeholders are defined as individuals, groups, or organizations that may affect, be affected of perceiving themselves to be affected by the introduction of an open AI infrastructure that aims to improve the Quality of Life (QoL) of cancer survivors while reducing costs to the healthcare systems and improving access to services. Overall, stakeholders are entities which they may be interested in the successful implementation of the results of the ASCAPE project or have a positive or negative impact in the execution of the project.

Since we described in the deliverable D5.3 the identified stakeholders with full details, here, we just list seven main categories of those groups based on their role in cancer fighting, as follows: (a) Healthcare professionals (b) Policy makers, (c) Insurance and social security funds (d) Healthcare industry (e) Scientific Community, (f) cancer patients and their care givers, and finally (g) media.

2.4 Key messages

ASCAPE, based on the methodology followed, analysis of the stakeholders, and their unique needs, redacted a list of pertinent messages that aim to persuade recognized stakeholders to embrace the results produced. As a result, any conducted activity should use those messages to these groups and informing them of our ambitions, results, and achievements. These key messages intended to bring the ASCAPE framework closer to acceptance and exploitation are built over five main pillars: (a) credibility of the source, (b) relevant advantage, (c) compatibility, (d) complexity, (e) trialability, and finally (f) observability of the solution. The exact list of messages per each pillar can be also found in the deliverable D5.3.

2.5 Communication contributors

ASCAPE, instead of creating an audience from the scratch, has used the partners as they play an important role in the execution of the Dissemination and Communication Plan and can help to maximize the reach to stakeholders. Each partner acts as a project ambassador, enhancing and propagating ASCAPE's messages, activities, achievements, and results to identified stakeholders. To coordinate this collaboration action a communication and dissemination group led by WP5 leader and consisting of a representative from each partner will oversee the respective activities. This group, if necessary, supports the relevant project activities and interacts with relevant stakeholders. In addition, partners are also responsible for providing the necessary information from their work to the WP5 leader on the website, newsletter, blog posts, social media, etc.

More specifically, each partner has the following responsibilities towards the projects:

- Writing scientific articles related to the concept of ASCAPE and individual developments.
- Provide information for the ASCAPE newsletter.
- Update the list of events in the ASCAPE communication and dissemination repository.
- Present the ASCAPE project at conferences, exhibitions, or other events.
- Provide reports and images from events that have participated.
- Provide external contacts.
- Provide several posts and blogposts each two weeks for ASCAPE social media and website respectively.

2.6 Roadmap

Timing is a critical factor for an effective communication approach. Depending on the project phase, time will determine the mode of communication. At the initial stage (M1-12) of the project, an effort was made to establish the communication and dissemination strategy and create initial awareness to stakeholders related to project objectives, scope and expected results. The second phase (M12-24), in which we are currently, is characterised by the creation of oriented awareness regarding project tools and services stakeholders and future users and the communication of their value proposition. The demonstration of early results and their validation is also foreseen at the end of this period. Hence, as the scientific output increases, more technical information will be directed to conferences, workshops, and scientific journals. The final, exploitation phase aims at maximizing market awareness on ASCAPE technologies by providing information from clinical trials, and at the same time receiving back evaluation feedback and suggestion for improvements from external stakeholders thus ensuring ASCAPE's sustainability and full exploitation. Either way, all project's results and produced information will be equally communicated to both field experts and the public to make possible the acceptance of the ASCAPE holistic solution.

3 Communication & Dissemination channels

The organization and participation of ASCAPE project in various events emerge from the need to disseminate its results stemming from scientific and technical work packages. These events would not only contribute to the dissemination of the produced knowledge to the targeted stakeholders but also receive valuable feedback, create opportunities for further interactions and foster the development of AI-based solutions for cancer care.

3.1 Offline channels

3.1.1 ASCAPE project events

Thanks to the detailed mapping of stakeholders performed under deliverable D5.3, ASCAPE already engaged key actors in AI and cancer care from Europe and beyond to special sessions, to provide a platform for discussions and interactions around different scientific approaches on the scope of the project. ASCAPE already organized such an event that because of COVID-19, it was not feasible to organise it in the context of a physical conference as was initially planned and described.
To mitigate the effects of this situation, ASCAPE organised on May 11, with the contribution of all partners, an online webinar on May 11 to provide an overview of the project with the latest developments at a technical and clinical level and inform about the upcoming open call for external parties. In addition, through this webinar, we intended to have a live interaction with the participants and identify potential obstacles that could prevent the adoption of our project's recommendations.

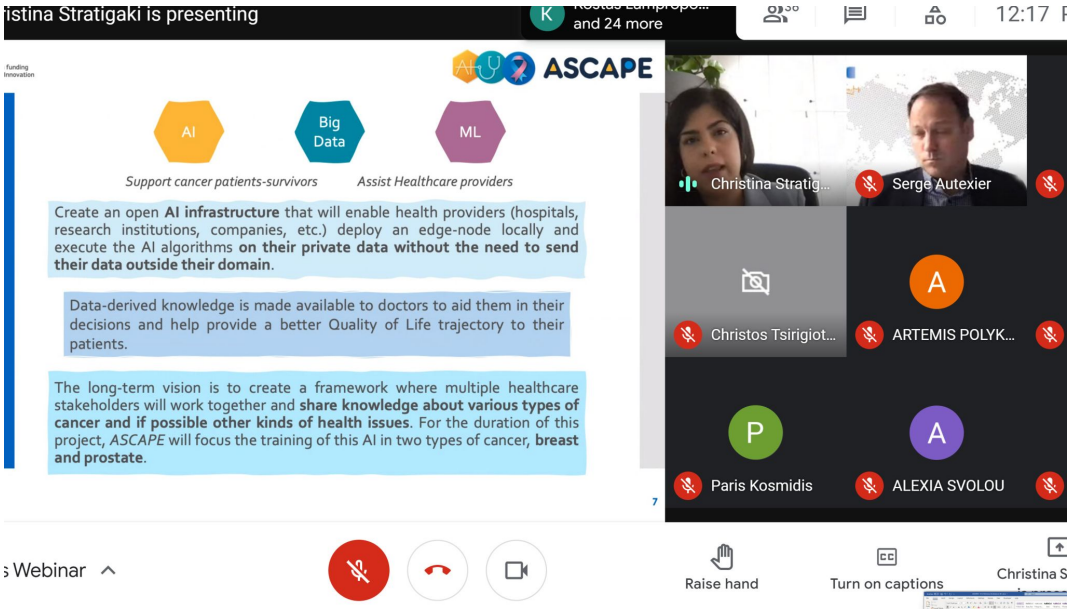


Figure 2 Snapshot of ASCAPE 1st Awareness workshop

Overall, 63 individuals attended this event, of which 35 of them were from various groups of stakeholders. To enhance the interactivity of the webinar and gain insights from them, they took place polls during the presentations and an open discussion session with the active participation of experts within the consortium.
To keep the impact of the webinar's content both to the attendees and other stakeholders we uploaded the presentations on the ASCAPE website and video recordings in our ASCAPE YouTube channel. More info on this webinar can be found on the deliverable D5.3.

3.1.2 External events

Attending carefully selected events has already proven to be very effective in terms of successfully implementing dissemination strategy. Given the increased focus on the impact shown by the results of ASCAPE and the expected social and economic benefits, the participating events are considered critical to the successful progress of the project.
In fact, from early on, the ASCAPE project participates in major events in the field of digital healthcare, Artificial Intelligence, Machine learning, Big data, and cancer research. Through these events, the consortium partners present the ASCAPE solution scope, challenges, ambitions as well as technical developments. The presentation of the project's results in external events is a keystone regarding dissemination purposes due to the participation of the scientific community and IT and healthcare experts.
During the first 18 months we presented ASCAPE at following events:

Bremen.AI Meet Up Event 'AI IN HEALTH' on 'AI in Care' (virtual): BREMEN.AI is the official cluster for Artificial Intelligence in Bremen. This cluster organises regularly events on the exchange of information between the AI scene and its players and, as a catalyst for Bremen's AI industry, promotes networking and knowledge transfer between industry and science with effective measures. Furthermore, BREMEN.AI promotes the matching of local AI jobs with talents, encourages the further settlement of AI talents, research institutions and companies and increases the supra-regional visibility of Bremen as a national and international AI hotspot.
During the second AI IN HEALTH meet-up that was devoted to 'AI in Care', Dr. Serge Autexier from DFKI gave a presentation on human-technology interaction and technology acceptance in health-related research projects in the context of the Bremen Ambient Assisted Living Lab (BAALL). The ASCAPE project was presented as one of the two main projects of the BAALL research group that is aiming at using AI/Machine Learning technologies to improve healthcare in a personalized and innovative manner.
Target audience: AI professionals and academics, healthcare and public health academics and professionals, entrepreneurs, academics from ethics and social sciences.
Estimated audience: Over 100.

International Conference on INnovations in Intelligent SysTems and Applications (virtual)

The ASCAPE project was presented at the International Conference on INnovations in Intelligent SysTems and Applications (INISTA) by Dr Konstantinos Lampropoulos, during the last week of August 2020. INISTA is a forum for researchers and practitioners where they are able to present their state-of-the-art results in the area of intelligent systems and a wide range of their applications. INISTA has been organized since 2005, and this time the event was organized by SKAMIJA Association, together with Yildiz Technical University and Faculty of Sciences, with technical co-sponsorship by the IEEE SMC Society.

Dr Lampropoulos from UoP represented ASCAPE on the panel dedicated to the research projects, presenting the project's consortium, the research goals and the importance of the creation of a framework where multiple healthcare stakeholders will participate to build and share knowledge about various types of cancer in order to identify and to address the key factors that will improve patients' quality of life. The panel has been organized in a way to allow participants and audience members to ask questions on the more technical and medical aspects of the projects, which was a great opportunity to establish contact with other researchers and obtain feedback.

Target audience: researchers from the entire spectrum of the multi-disciplinary fields of intelligent systems.
Estimated audience: 40.

2020 TechMed Event (virtual)

The TechMed Centre and the WTC Twente organized the 2020 TechMed as an online event that spreads its sessions over the autumn of 2020 with several online pre-meetings. This online event includes sessions for the five areas of AI & Intelligent Imaging, Personalized eHealth, Health Robotics, Nano Biotech, and Innovation meets Industry. On September 24th Dr. Serge Autexier from DFKI gave a presentation for the topic "Predictive Modelling: From Data Collection to Clinical Value" in Pre-session Monitoring and Smart Analysis for Personalised eHealth.

Figure 3 ASCAPE presentation at 2020 TechMed

The talk addressed to issue that 'Use Machine Learning' has become a appealing approach for personalized risk analytics or predictions in health care and related areas. Promoted by the impressive performance of ML-based techniques for disease diagnostics, very often in the domain of medical imaging, it is sensible to seek their application to further personalized analytics. During the talk, the recent and especially the ongoing research in ASCAPE was presented, providing an overview of the difficulties of using legacy patient data as well as prospectively collected data from multiple sources in order to train and use analytics models. Finally, it shed light on the challenge to obtain explanations from analytics models that are useful for the experts in the application domain of health.

Target audience: healthcare professionals, MedTech entrepreneurs and researchers.
Estimated audience: 40.

5th conference of the "Oncology Quo Vadis" (25/09/2020, Limeni, Greece)

The Greek College of Senology organised the 5th conference of the "Oncology Quo Vadis" series in the end of September 2020. The topic of this conference was "The

doctor's agony after the first success" and aimed to capture the variety of complications that emerge from clinical practice, and ways to overcome them. The target audience of the conference was mostly clinicians and scientists; Continuing Medical Education (CME) credits were provided as part of their participation.
Thanos Kosmidis from CareAcross was invited to speak on the topic of Artificial Intelligence and the various possibilities in oncology. The presentation was provided in the context of a roundtable themed "The patient's advocate". The delivered presentation introduced the audience to the high-level concepts of Artificial Intelligence, its general applications, and the more specific ones as related to healthcare and cancer. Subsequently, it shifted the focus from the disease diagnostics to the concept of patient "micro-diagnoses": how can the combination of continuous learning and big data support the several "micro-diagnoses" performed by patients and clinicians every day around the patient's quality of life?
In that context, ASCAPE was presented as an innovative, EU-funded project that aims to showcase the power of such interactions and data collection, through Artificial Intelligence and Big Data and with the support of wearable devices. The two cancer types being supported (breast and prostate) were described in the context of the patient experience and the corresponding data being collected. Moreover, the selected Quality of Life Issues were presented, supported by a corresponding overview of the potential impact to patients and clinicians. During the lively Q&A session, the audience asked about the receptivity of this innovation among clinicians, and the possible risks that may arise from its assimilation in standard clinical practice.

Target audience: healthcare professionals.
Estimated audience: 50.

Developments and Challenges in Oncology (7/10/2020, Athens, Greece)

A scientific conference titled "Developments and Challenges in Oncology" with the subtitle "Interdisciplinary approach for all our patients" was organised in early October of 2020. The target audience of the conference was mostly clinicians and scientists; Continuing Medical Education (CME) credits were provided as part of their participation.
Thanos Kosmidis from CareAcross was invited to speak on the topic of "The Internet and Oncology in the age of COVID-19". This session aimed to capture the more contemporary aspects of interdisciplinary management of patients, especially in an environment where changes are accelerated by COVID-19. During the presentation, it was discussed the introduction of technology in healthcare in general, and oncology in particular. A short breakdown of key developments was provided, with a focus on the enabling technologies and the impact they have on the shifting environment and evolving relationship between patients and their clinicians. A deeper dive was provided

for the technologies and offerings of Artificial Intelligence in the field of medicine. This included the key goals, the importance of (big) data, their structure, and the technologies' impact on decision-making. This was then presented in the context of the key applications and goals, the early "wins" in the field, but also the ethical and legal parameters to be accounted for. Finally, the challenges of expectations management were outlined.
ASCAPE was presented as a prime example of an interdisciplinary innovation that can substantially improve the experience of patients, but also clinicians. Some of the capabilities that it enables (including remote patient monitoring, telemedicine, as well as remote/site less/virtual clinical trials) were outlined, and a brief "case" was described that illustrated how the variety of data being captured can help the patients and their doctors.
An interesting question was raised during the brief Q&A session, which focused on the geographical aspects of these innovations. More specifically, the doctor asked if some countries are further ahead of others in Artificial Intelligence when it comes to medicine. The subsequent discussion included that while clinicians and healthcare institutions in some countries are more open to trying out innovations, the nature of such technologies enables their benefits to be transferable to other locations relatively fast.
Target audience: healthcare professionals.
Estimated audience: 50.

San Antonio Breast Cancer Symposium, 2020 (Virtual).

This Symposium that took place online on 8-11/12/2020 was designed to provide state-of-the-art information on the experimental biology, etiology, prevention, diagnosis, and therapy of breast cancer and premalignant breast disease, to an international audience of academic and private physicians and researchers. The scientific program of the 2020 version of the conference consisted of formal lectures by experts in clinical and basic research, selected slide and poster presentations, forums and case discussions.

ASCAPE presented its approach on how Artificial intelligence can support cancer patients across Europe. Specifically, we showcase the design of ASCAPE clinical trials and their specific aims, the eligibility criteria for breast cancer patients' participation, statistical methods, and finally we presented the retrospective datasets will be used as well as the number of patients that will participated in the defined time framework. Our presence in that workshop also included a poster presentation.

Target audience: healthcare professionals.
Estimated audience: 8000.

19th International Symposium on Intelligent Data Analysis - IDA 2021(Virtual)

IDA (Intelligent Data Analysis) 2021 which took place on 26-28/4, 2021 is a symposium focused on advancing intelligent data analysis with the goal to present novel, potentially game-changing ideas. In parallel, IDA's mission is to promote ideas over performance since they consider that motivation can be as convincing as empirical evaluation. Therefore, in this symposium is included inspiring work from researchers for both presentation and publication. To keep an open atmosphere that encourages discussion, IDA symposia are intentionally small-scale and single-track.

ASCAPE was present at this event, through a poster presentation Johannes Rust, DFKI, that analyzed the findings on using machine learning in simulation-based data analytics to identify quality-of-life-increasing interventions for prostate- and breast cancer patients and more specifically, highlighted the value of the analysis of data for correlations and dependencies between interventions and other variables, as source of knowledge interpretable by the users.

Target audience: AI researchers and data analysts.
Estimated audience: 50.

NTNU Digital Transformation stakeholder workshop (Virtual)

The stakeholder workshop on digital transformation was held as a digital meeting on June 8, and it targeted to share experiences and discuss possibilities regarding the digital transformation of health services, manufacturing and processing industry, sustainability and citizen involvement. This is part of NTNU's the Digital Transformation initiative established in 2018 to pursue transformative research on the development and application of digital transformation technology. The focus of this one-day workshop was on workshop citizen involvement in a digital society, the influence of digital transformation on sustainability, the trust and ownership of health data in a digital transformed healthcare system, and the digital transformation of manufacturing and processing industry.

ASCAPE project was orally presented by Anamaria Vizitiu from Siemens SRL and focused around on what mechanisms ASCAPE's using to secure the trust and ownership of health data in the proposed open digital framework for cancer patients' support.

Target audience: AI researchers and data analysts, healthcare professionals, policy makers.
Estimated audience: 30.

27th Hellenic Conference of Clinical Oncology (Virtual)

The 27th Greek Congress of Clinical Oncology that took place on 13-15/5/2021 targeted to focus on the pioneering developments that are taking place and on the new discoveries and important challenges that the future holds regarding cancer fighting. In this year's edition were included developments concerning the introduction of big data which has accelerated clinical and basic research collaboration, and artificial intelligence and machine learning as they are expected to be integrated into clinical practice soon. At the same time a focus was given to session about the need for a comprehensive cancer treatment that bridges the prevention and early diagnosis, research, treatment and palliative care.

ASCAPE participated in this conference through a poster presentation with the title "Prediction of early and late mortality of cancer patients treated in intensive treatment units (ICU) using "big-data" and machine learning algorithms" reporting part of the research work done in the context of the project.

Target audience: healthcare professionals.
Estimated audience: 60.

3.1.3 Synergies

As part of its efforts to strengthen our dissemination activities, ASCAPE seeks partnerships with other projects and organizations to strengthen existing efforts and shape the future of cancer patient support. The first step in this direction was to take advantage of the participation and contacts of the partners in other national and European projects. Particular attention is paid to the participation of our cooperation with European research and innovation projects in relevant scientific fields, as they have already been developed. Some of the projects that have been identified and targeted are FAITH, Lifechamps, FORTEe, INCISIVE, Desiree, but this does not mean that this search will not be continuous.

The purpose of these synergies is to: (a) prevent the reproduction of the work, (b) create the conditions for research collaborations, (c) connect with communities that are otherwise difficult to reach, (d) increase visibility and impact.

As tangible example of this effort, ASCAPE together with EU projects TeNDER, SHAPES, ASSIST IoT, Smart-Bear will have the responsibility to the technical support of the 1st Workshop on Artificial Intelligence and Internet of Things for Digital Health (AIIOT4DH) that will take place on December 16 - 18, 2021 at Washington D.C., USA in the context of IEEE/ACM's Conference on Connected Health Applications, Systems, and Engineering Technologies.

3.1.4 Publications

All ASCAPE academic and technical partners, as individuals or collectively, are obliged to present scientific findings that have been generated during the project in scientific conferences and high-impact journals. As shown earlier, this is one of the most important ways to disseminate scientific results to the targeted stakeholders. To this end, we have compiled and maintain a list of conferences and journals in our internal communication and dissemination repository to help partners disseminate their findings.

With regards to the agreed process, and as stated in article 29.1 of the Annotated Model Grant Agreement, all partners intend to disseminate its outcomes "*must give prior notice to other beneficiaries for at least 45 days, unless otherwise agreed, together with sufficient information on the results to be disseminated. Any other beneficiary may raise objections unless otherwise agreed 30 days after the receipt of the notification if it can demonstrate that its legitimate interests are significantly affected in relation to the results or the background. In such cases, dissemination cannot take place unless appropriate measures are taken to safeguard these legitimate interests*".

ASCAPE is also committed to make the generated results be published free of charge, primarily based on journals that use the gold open OA method (the paper is immediately accessible to everyone with no charge). However, partners could also follow the green OA method in which each partner (with the guidance of WP5 leader) should make the work available by archiving it in a repository (after or in parallel with publication), which may be central, institutional or topic related. In this case, the publication will be available as a peer-reviewed, pre-publication, machine-readable version of the final publication. However, an embargo period may apply depending on the publishers self-archiving policy. Nevertheless, authors must establish the open access character of the work within six months of the publication (the time framework and special terms for each scientific magazine can be found at Sherpa/Romeo online tool and dissem.in platform to guide their authors to upload them to an open repository) and provide open access through the repository to the bibliographic metadata of the respective publication.

Finally, unless the EC requests or agrees otherwise or is not possible, any dissemination of the results (in any form, including electronics) must demonstrate the EU emblem and include the following text: "*This work is carried out as part of the EU-funded Research and Innovation Action, Artificial intelligence Supporting CAncer Patients across Europe (ASCAPE) (Project ID: 875351), [H2020-SC1-DTH-2019] SC1-DTH-01-2019, Big data and Artificial Intelligence for monitoring health status and quality of life after the cancer treatment.*" . Last, any kind or form of dissemination activity regarding ASCAPE results must indicate that it only reflects the view of the

creator, and that the Agency is not responsible for any use of the information contained therein.

The productivity of ASCAPE in scientific publications throughout the the first half of the project was, as expected, limited due to the initial intensive research activity of the project and consequently, the obtaining of scientific results. The following papers have submitted:

Konstantinos Lampropoulos, Thanos Kosmidis, Serge Autexier, Miloš Savić, Manos Athanatos, Miltiadis Kokkonidis, Tzortzia Koutsouri, Anamaria Vizitiu, Antonios Valachis and Miriam Quintero Padron, "**ASCAPE: An open AI ecosystem to support the quality of life of cancer patients"**, at IEEE International Conference on Healthcare Informatics.

V. Danilatou, D. Mavroidis, D. Antonakaki, A. Kanterakis, C. Tzagkarakis, T. Kostoulas and S. Ioannidis, "**Big-data and Machine Learning Prediction of Early and Late Mortality in ICU Patients with Venous Thromboembolism and Comparison with Classic Scoring Systems**", in 2021 International Society on Thrombosis and Haemostasis Congress (ISTH), Philadelphia, PA, Jul. 2021.

Andreea Bianca Popescu, Ioana Antonia Taca, Cosmin Ioan Nita, Anamaria Vizitiu, Robert Demeter, Constantin Suciu, Lucian Mihai Itu, **"Privacy preserving classification of EEG data using machine learning and homomorphic encryption"**, Applied Sciences, 2021.

Miloš Savić, Vladimir Kurbalija, Mihailo Ilić, Mirjana Ivanović, Dušan Jakovetić, Antonios Valachis, Serge Autexier, Johannes Rust and Thanos Kosmidi, **"Analysis of Machine Learning Models Predicting Quality of Life for Cancer Patients"**, The 13th International ACM Conference on Management of Digital EcoSystems (MEDES'21).

Valachis, A., Autexier, S., Grau, I., Itu, L., Jakotevic, D., Kosmidis, T., ... & Kosmidis, P. (2021). Abstract OT-39-01: **Artificial intelligence supporting cancer patients across Europe-the ASCAPE project for breast cancer patients**.

Ángeles Fuentes, Clara Amat, Imma Grau, Montserrat Muñoz, Olga Martinez, Nuria Chic, Barbara Adamo, Maria Vidal, Irene Fernandez, Antonis Valachis, Lazaros Tzelves, Thanos Kosmidis, Miltos Kokkonidis, Raimundo Lozano-Rubí, **Use of mHealth tools and electronic health records integration to improve the quality of life of breast cancer patients – implementing the ASCAPE project in the clinical practice**, ESMO Congress 2021 - European Society for Medical Oncology.

Once of ASCAPE's major achievements is that the project has been published on clinicaltrials.gov through the work of Region Örebro County partner. This step is

essential for clinical trials to be able to publish the results in high-impact medical journals. Clinicaltrials.gov is the largest database for clinical trials in progress worldwide (the database is driven by the National Institute of Health, USA). In medical research, it is of outmost importance to register a prospective study as ASCAPE to clinicaltrials.gov to be able to publish the results to high-impact journals later on.

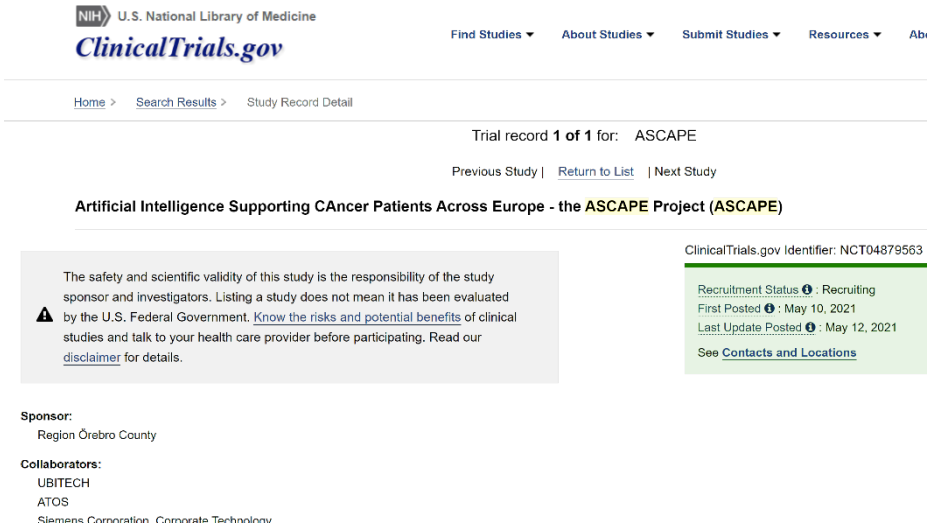


Figure 4 ASCAPE account on ClinicalTrials.gov

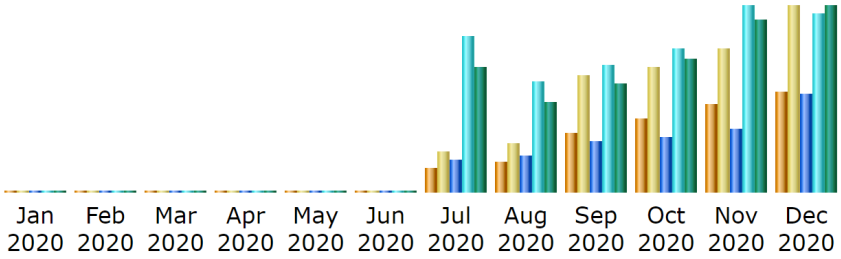
3.2 Online channels

3.2.1 ASCAPE website

Accessible at https://www.ascape-project.eu/

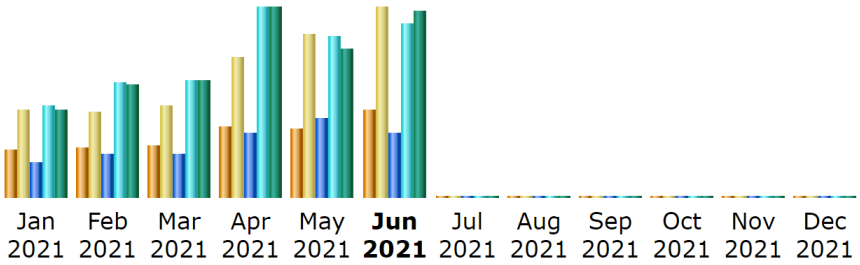
The ASCAPE website is the most valuable web channel in terms of dissemination and communication. Through the website, we can convey our messages, announce the project activities, and challenge external stakeholders to interact with us. The main objectives of this project period were: (a) to maintain an active online presence by creating content regularly, (b) to improve the search engine ranking of the website, (c) to enhance the interaction between the site and visitors, (d) upload of public deliverables, advertising, and information material (e.g., presentations, brochures), (e) perform all necessary maintenance.

ATOS, as a partner responsible for the day-to-day operation and maintenance of the website, regularly analyses qualitative and quantitative data using an in-house analytics tool. The reason behind the use of this tool is that we want to improve the user experience, identify the most attractive content, improve the SEO of the site, track who gave the most traffic to the ASCAPE site and create strategies to get more citations from these sources.



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2020	0	0	0	0	0
Feb 2020	0	0	0	0	0
Mar 2020	0	0	0	0	0
Apr 2020	0	0	0	0	0
May 2020	0	0	0	0	0
Jun 2020	0	0	0	0	0
Jul 2020	134	223	1,225	6,049	160.08 MB
Aug 2020	172	269	1,422	4,292	114.52 MB
Sep 2020	331	648	1,979	4,969	138.16 MB
Oct 2020	410	700	2,117	5,607	168.97 MB
Nov 2020	491	805	2,434	7,257	218.67 MB
Dec 2020	553	1,036	3,845	6,989	236.93 MB

Figure 5 ASCAPE website traffic - 2020



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2021	666	1,204	2,254	5,920	229.19 MB
Feb 2021	678	1,182	2,797	7,414	295.02 MB
Mar 2021	714	1,274	2,780	7,568	306.07 MB
Apr 2021	962	1,921	4,089	12,228	496.03 MB
May 2021	958	2,261	5,057	10,433	387.46 MB
Jun 2021	1,206	2,618	4,202	11,219	485.27 MB

Figure 6 ASCAPE website traffic - 2021

Table 3 ASCAPE website cumulative analytics

Website overall metrics (M6-18)	
Unique visitors	7275
Number of visitors	14140
Pages visited	34200
Pages/Visit	2.23

For the last twelve months, the ASCAPE website had almost 7300 unique visitors, as shown in Figures 5 and 6. Altogether, more than 14.100 sessions were performed, with most of them being first-time visits and approximately 34.200 pageviews took place. The average time spent per person for a visit was just over three minutes and the average pages per visit are close to 2,2.

3.2.2 ASCAPE social media

In addition to our online presence, the ASCAPE project has put a lot of effort into establishing its visibility on social media channels, as we have realized early on their dynamics and value when used properly. In this context, the presence of the project on three of the most popular social platforms allowed us to carry on a two-way communication with relevant to the field communities.

Twitter

The Twitter ASCAPE account is used as one of the channels for transmitting short and concise messages. In this way, during the first half of the project we provided posts on the news and activities of the project, shared our key messages, interacted with the accounts of partners and related projects, and expanded our network with stakeholders in the field of artificial intelligence and cancer research. In addition, social media accounts play an important role in website traffic, as it is the main source for the audience wanting to learn more about the project.

Table 4 ASCAPE Twitter analytics

Metric	Value	Attributes
Tweets	230	
Following	303	
Followers	148	

Metric	Value	Attributes
Total Impressions	125.632	Total number of times users saw tweets on Tweeter
Engagements	1914	Total times of times a user has interacted with a tweet. This includes all clicks anywhere on the tweet, retweets, follows, and likes
Engagement rate	1,52	The number of engagements divided by the total number of impressions

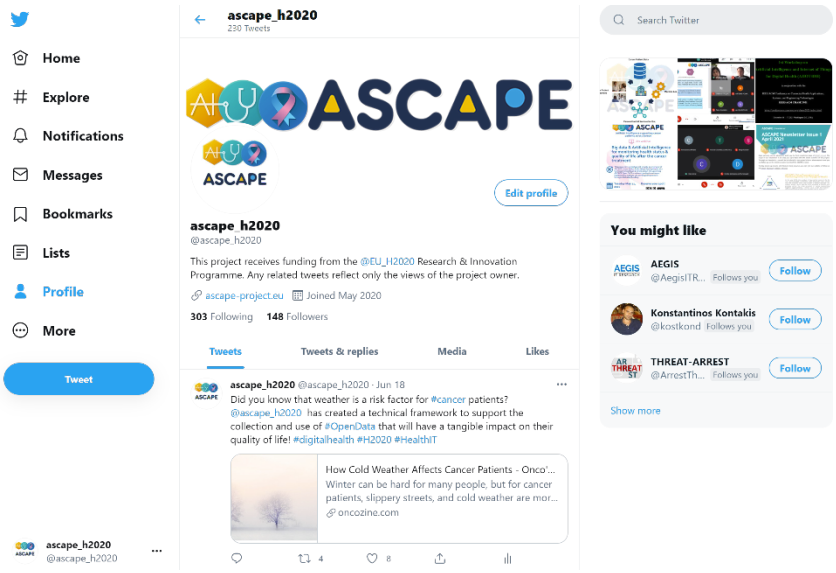


Figure 7 ASCAPE Twitter account

LinkedIn

LinkedIn is mostly known as a place to look for a job or develop a business network. However, it can give to a project like ASCAPE the opportunity to cultivate its public image on a global scale, create new business leads, collaborate with professionals in the field and provide a narrative about the potential exploitation of our results. The ASCAPE LinkedIn company profile was used to disseminate pertinent content, to communicate the framework and technical solutions, to show our competitive advantage over other solutions, to monitor the developments of potential competitors in the field and to approach people who they could participate to the project activities in different ways. As we said before, to facilitate the access of the public interested in ASCAPE and to make it more reliable and trustworthy, we provide a link to our website.

Table 5 ASCAPE LinkedIn analytics

Metric	Value	Attributes
Updates	230	
Followers	71	
Total Impressions	11.512	Total number of times users saw tweets on LinkedIn
Engagements	1045	Total times of times a user has interacted with a post. This includes all clicks, reactions, comments follows and shares
Engagement rate	9,08	The number of engagements divided by the total number of impressions

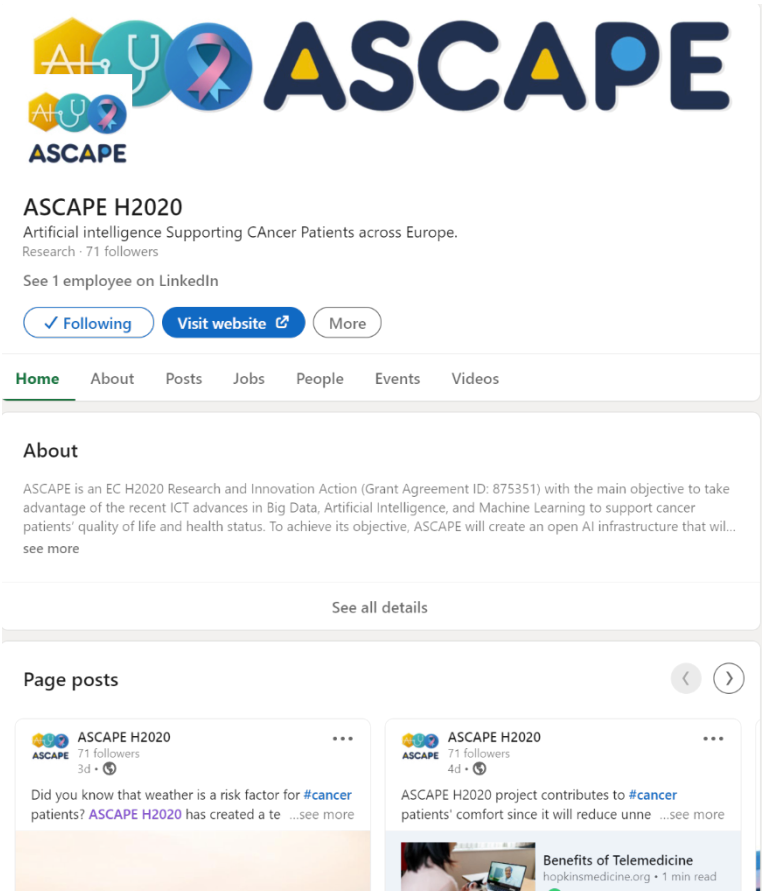


Figure 8 ASCAPE LinkedIn company page

Facebook

Facebook is the most popular platform that allows users to connect with friends, groups, or people with similar interests on the internet. It also allows users to share pictures, videos, and articles, as well as their own thoughts and opinions with other people. Organizations like ASCAPE can also create their own page as a powerful way to communicate with peers and prospects, allowing them to see our proposed post-treatment cancer care solutions in an easy and understandable way. The content posted is like other ASCAPE social media channels. Finally, during the first half of the project, we recorded 230 posts and 38 followers.

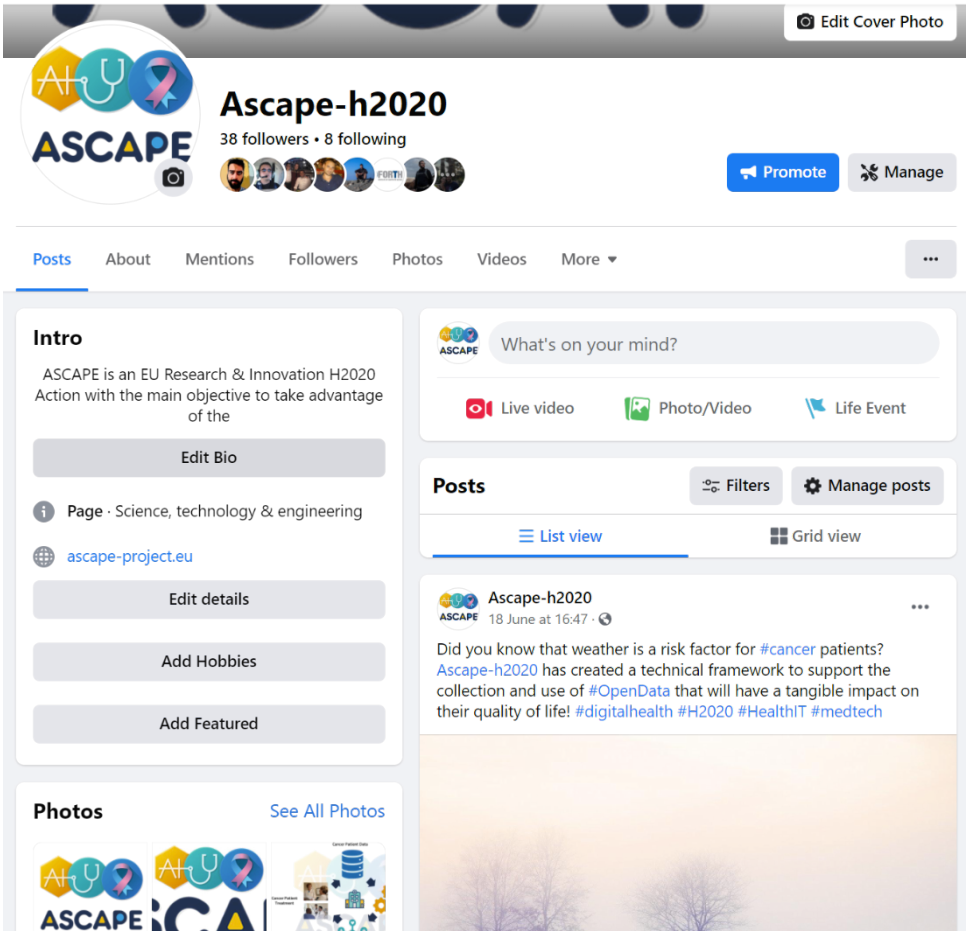


Figure 9 ASCAPE Facebook page

3.2.3 External Media coverage

Serge Autexier from DFKI, the technical coordinator of the ASCAPE project, gave an interview on how ASCAPE can improve cancer survivors Quality of Life through Artificial Intelligence at the Future of Healthcare platform which was published on June 9th, 2021. Future of Healthcare is a portal that provides content about innovation, digital transformation, patient empowerment, start-ups, and new trends in the

healthcare industry. In cooperation with the platform and the project partners we agreed to provide three more interviews on clinical, patient, and ethical/legal aspects of the project and at a later time to organise a podcast merging all the above topics.

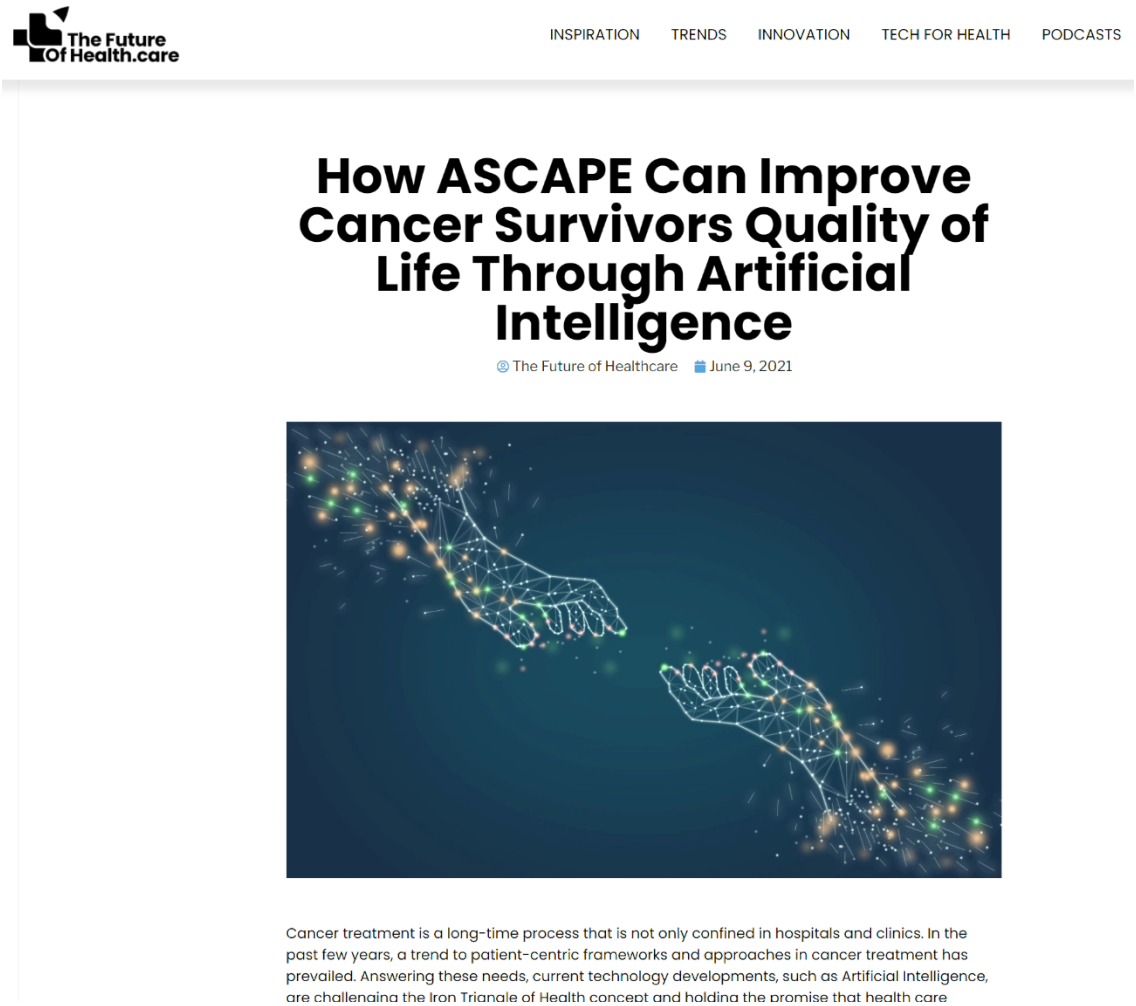


Figure 10 Interview on “The Future of Healthcare” portal

4 Communication & Dissemination tools

4.1 ASCAPE informational material

4.1.1 Brochure

The main objective of the project brochure is to elucidate its ambition and value proposition to a particular group or the public, to answer questions about the consortium, and to guide the reader to find out more about the project. As we intended to keep the content simple, comprehensive, and clear, we laid down the vision, challenges, and individual objectives of the ASCAPE project. Furthermore, we presented a high-level overview of the technologies we are bringing, a bird's eye view of the framework and a description on how we are going to test it. On the back page, we include the website and social media addresses via links and QR code and provide information about the consortium and the partners.

A second edition of the brochure will be published in the second half of the project, which will include up-to-date content, a summary of the preliminary findings and an updated layout. The brochure will also be printed in a few copies and will be distributed at any event / conference / exhibition attended if conditions allow. To promote this effort, it is also shared through the website and social media. Finally, it is foreseen to be translated into other languages on the occasion of clinical trials.

Figure 11 ASCAPE brochure

4.1.2 Posters

Posters are a remarkably effective method of presenting scientific research, as it allows the display of information making it much more memorable than an oral presentation. To achieve its purpose, it must find a balance between content and visual representation. If successfully designed, it can serve as a source of information, chat starter, networking opportunity, advertising, and summary of technical work.

During the first 18 months, ASCAPE partners created three different conference posters (citing a previous section) considering the principles outlined above. In terms of content, as shown in the figures below, they evolved around the scientific achievements of the project. During the project, we will also design wider field posters to present ASCAPE and its activities to a wide audience by providing only the information that is necessary to attract their interest.

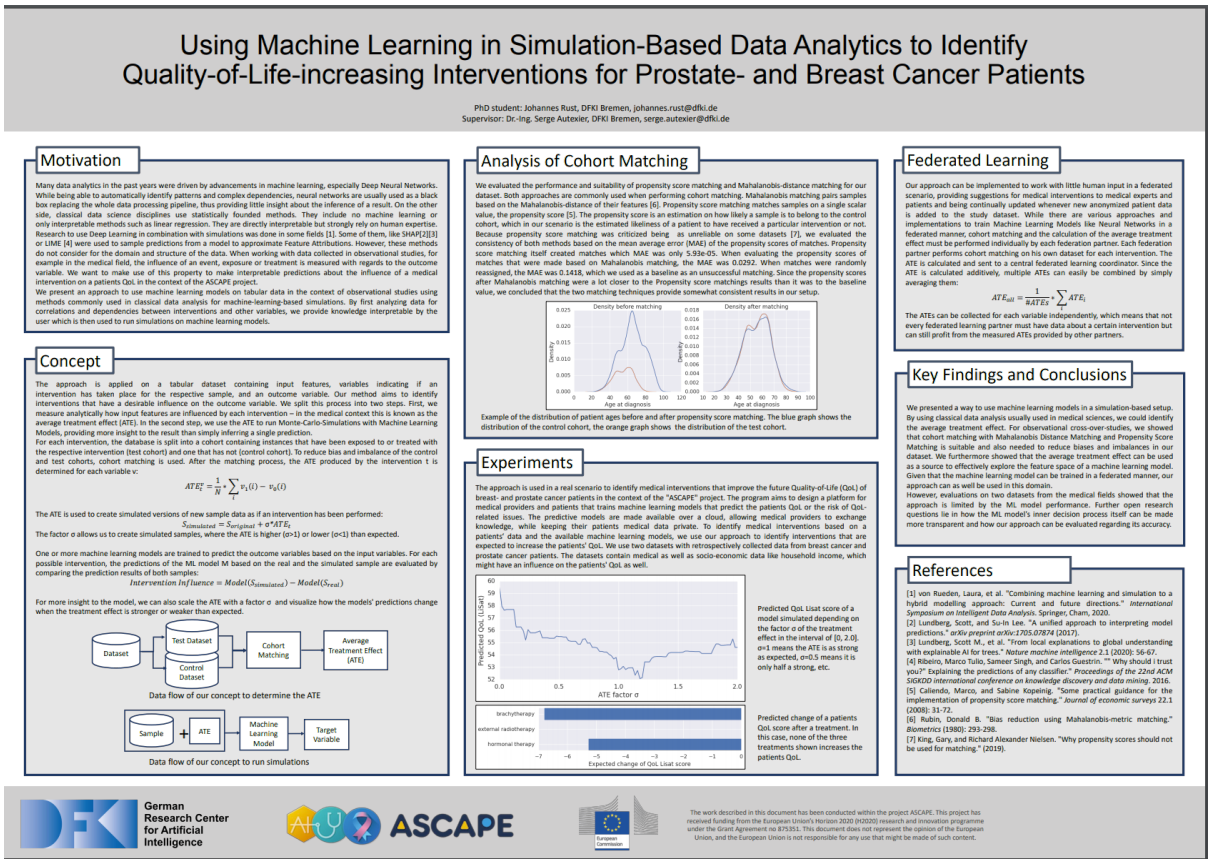


Figure 12 ASCAPE poster at IDA2021

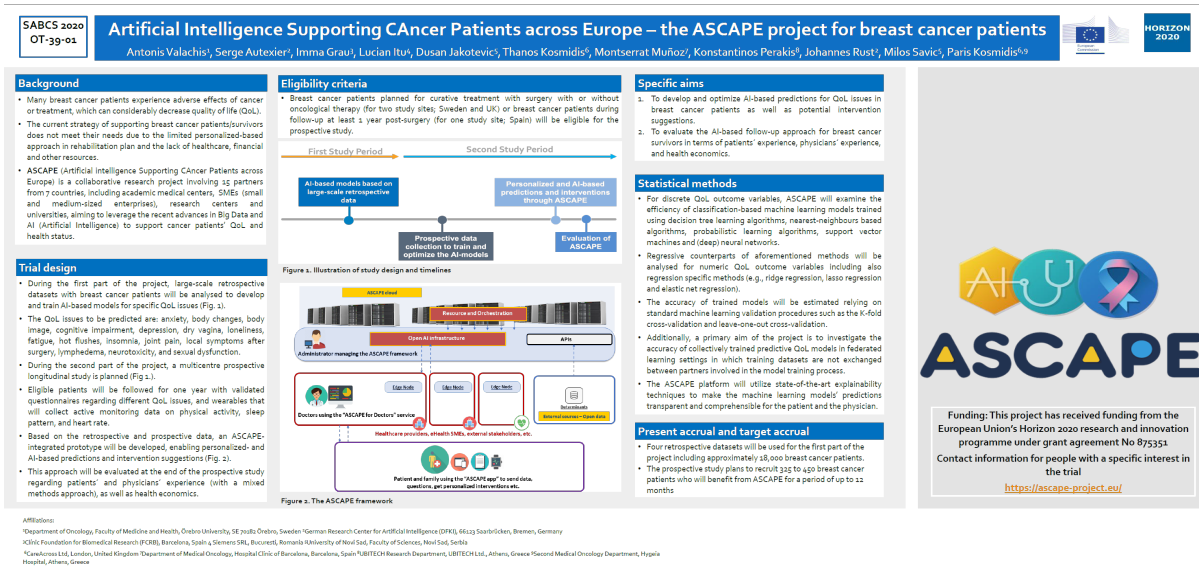


Figure 13 ASCAPE poster at 2020 San Antonio Breast Cancer Virtual Symposium

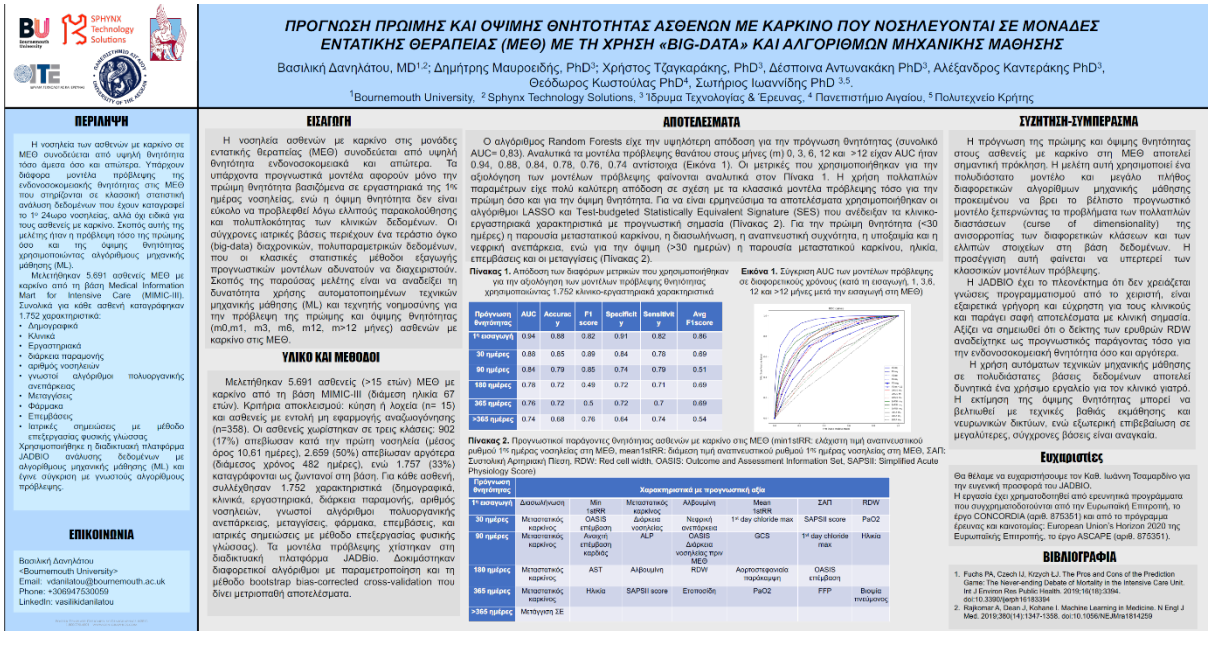


Figure 14 ASCAPE poster at 27th Hellenic Conference of Clinical Oncology

4.2 ASCAPE Digital material

4.2.1 Press releases

Press releases are considered as a useful tool to inform all kind of audiences about specific events and important milestones achieved. It allows to increase awareness and attract more interest in our activities. Hence, we plan to distribute ASCAPE press releases to specific media contacts to announce events like the commencement of the clinical trials at the open call for external participants that will launch the next months.

4.2.2 Newsletter

Newsletters are considered a convenient tool for keeping updated ASCAPE's audience while showcasing partners' research and industry expertise. Through newsletters, we aim to build a lasting relationship with our e-mail subscribers, let them be aware of the project's progress and results, related news, special events, interviews, and other material. It is prepared and sent every six months using various channels and recipients. For the first issues, we mostly target the public to increase visibility and awareness, while for the next period we will address more intensively with the announcement of scientific results. Given the purpose and significance of the newsletter, is meant to be concise, avoiding technical terminology and overall making the document catching enough for every kind of reader want to find out more about our project and interact with ASCAPE.

Both the first and the upcoming newsletter will be email-based and will be sent through the Mail Chimp online platform, to the list of newsletter subscribers created through the platform, but also using social media channels and the ASCAPE website. The common structure of each newsletter consists of an introduction summarising the content and identity of the project, a section dealing with ASCAPE's scientific work, a chapter that displays news about external activities, and finally, a closing section that each reader can find contact and other related information. The second issue of the newsletter will be published at the first days of July incorporating information about the ASCAPE Open call and informing about the latest developments and news.

ASCAPE 1st Newsletter

View Report

Campaign Preview HTML Source Plain-Text Email Details

ASCAPE | Newsletter

ASCAPE Newsletter Issue 1 April 2021

Dear partners, we are pleased to send you the first newsletter issue of ASCAPE project. The scope of our newsletter is to keep you up-to-date with the latest activities of the project. Through our newsletter, you will be introduced to our project's latest advancements and you can follow up on the latest news and events of the ASCAPE project.

To stay always up-to-date and discover more about us, you can visit our website or follow us on Twitter, Facebook, LinkedIn, YouTube.

ASCAPE's Value Proposition and Positioning in the Iron Triangle of Health

In the year 2018, the number of new cancer cases in the EU was approximately 3.91million (non-melanoma skin cancer was not included) while the number of deaths reached 1.93 million. Breast cancer was the most prevalent in females and prostate cancer the most prevalent in males representing together approximately 1 million cases. Given the incidence and survivorship of breast and prostate cancer, they represent an important health problem for European countries. Discover more...

From data collection to clinical value: The Challenges for the realisation of the ASCAPE vision

The ASCAPE projects aims at offering personalized prediction services for quality of life for cancer patients and personalized intervention suggestion services to help to improve their quality of life. The methodology of choice is to train predictive models from patient data using machine learning techniques. ASCAPE aims at closing the full circle starting from a close integration of data collection mechanisms with clinical processes via the development of predictive models and their inclusion and trustful adoption in the clinical practice. Find out more...

Moving the ASCAPE forward: focusing on pilot design, data determinants and evaluation process

As the ASCAPE project is moving forward, an essential work has been done in order to determine the design of the different pilots, establish the data determinants in terms of quality of life (QoL) issues to be predicted, as well as the variables of interest in retrospective and prospective datasets that will be used for providing predictions and intervention suggestions, and agree on a common framework within the pilots to evaluate the ASCAPE. Discover more...

Figure 15 ASCAPE 1st newsletter - 1/2

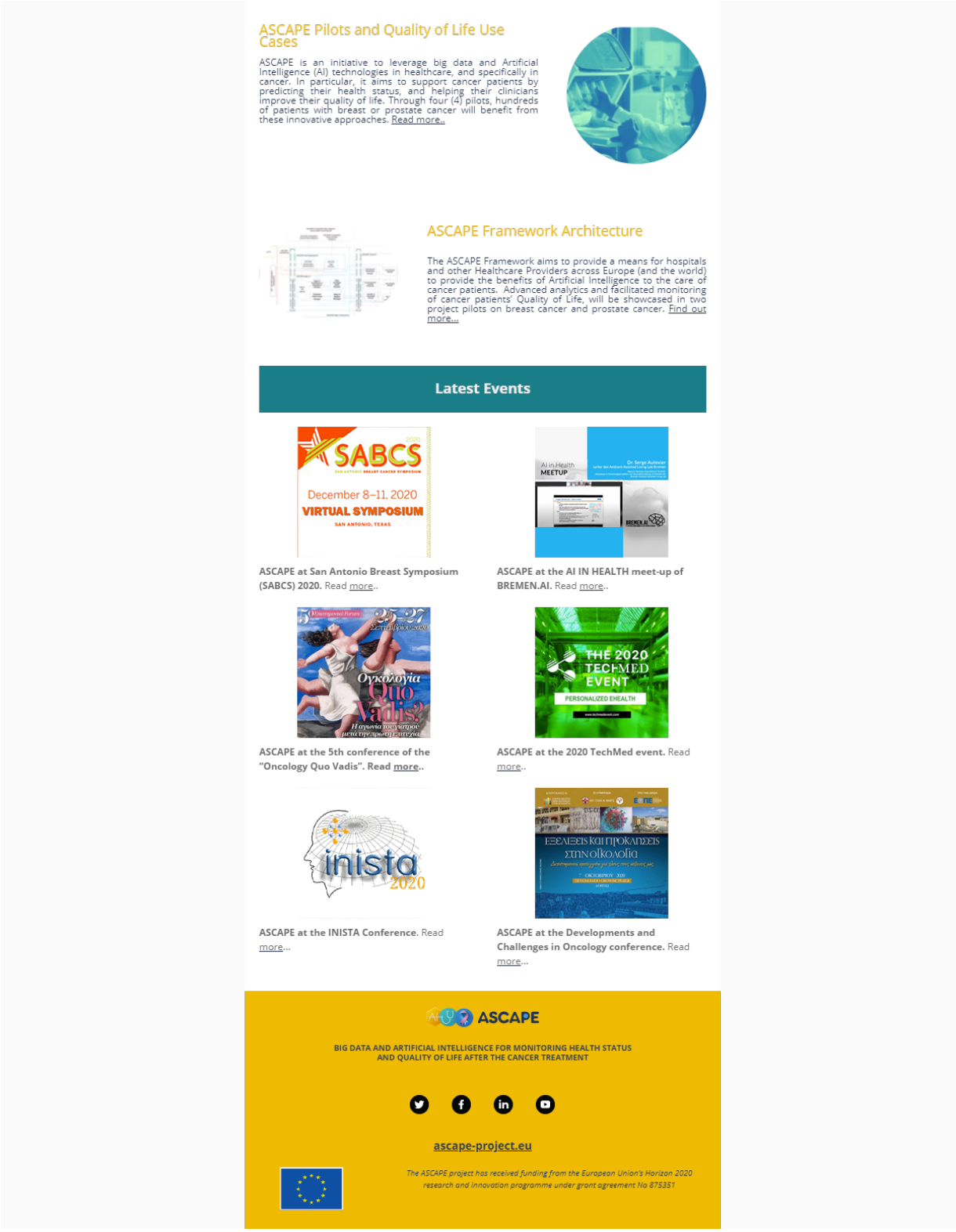


Figure 16 ASCAPE 1st newsletter - 2/2

4.2.3 Videos

In recent years, video material is known to be in great demand. ASCAPE is already taking advantage of this tool as it is considered very attractive for message conveying. Hence to capitalize on this trend, we uploaded four videos to our YouTube channel with content that came from the various topics (project overview, ASCAPE framework, and technologies, clinical trials, open call) of our awareness webinar. As far as next months, we expect to produce more videos, such as a short film (three to five minutes) to present the scope and results of ASCAPE in a clear and comprehensive way. Furthermore, a video informing Open Call participants how to submit step-by-step their proposals will also be uploaded to our YouTube channel.

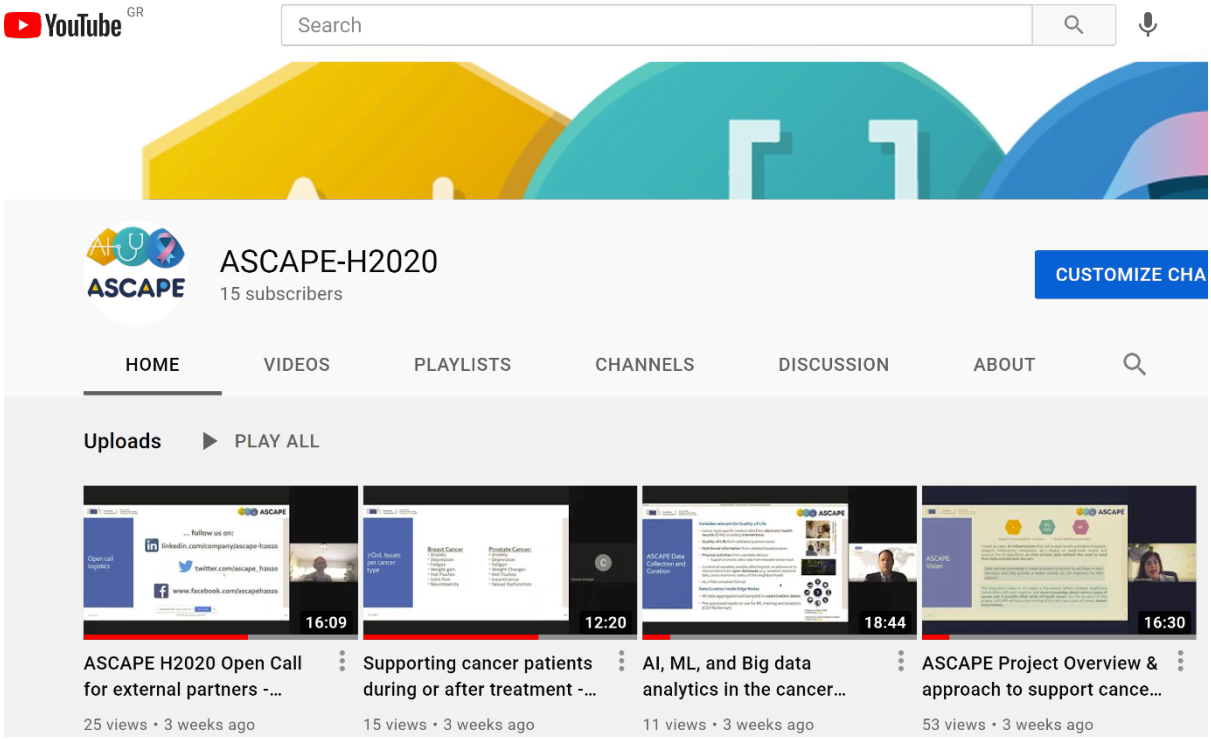


Figure 17 ASCAPE's YouTube channel

5 Communication and Dissemination assessment

The ASCAPE communication and dissemination plan is evaluated on a regular basis throughout its duration in terms of efficiency and effectiveness, as well as the individual quality of the specific actions. For this reason, we have defined several key performance indicators to assess the impact of dissemination and communication activities, as described in previous sections.

Table 6 Communication and Dissemination Key Performance Indicators

	KPI	Target Value	Planned for Phase1 (M1-M18)	Current Status
Dissemination Non-Interactive Activities	Scientific papers submitted in journals in the domain	≥10	2	1
	Scientific papers submitted in conferences	≥20	5	5
Dissemination Interactive Activities	Posters presented in conferences	≥3	1	3
	Number of scientific & technical workshops organized	≥2	0	0
Communication Activities	Blog posts uploaded on project website	≥ 30	13	10
	Videos uploaded on YouTube channel	≥ 3	1	3

	KPI	Target Value	Planned for Phase1 (M1-M18)	Current Status
	Public presentations available online (e.g., on Prezi)	≥ 4	1	3
	Training material (user manuals/presentations)	≥ 4	1	1
	Newsletters distributed to identified stakeholders	7	2	2
	Leaflets and flyers distributed to various events	≥ 250	100	110
Website	Number of unique visitors	5000	1000	7275
	Average visit duration	~ 2min	~ 2min	2,23
	Number of page views	>10000	3000	34200
Social Media	Number of accumulative posts	1000	250	690
	Number of accumulative followers	600	125	275
	Number of interactions in social media	4000	700	3453

6 ASCAPE exploitation

6.1 Introduction

Around the world healthcare authorities are struggled by the raising of healthcare costs as well by cuts in their budgets. The COVID-19 has not only devastated the economy and disrupted the healthcare system but, it has also changed our lives and the way we receive car (Nyatanga, 2020).

Cancer diseases are leading causes of death in Europe. It is estimated that, 3.7 M people are diagnosed with cancer yearly[2], and 1.3 M people die of cancer in Europe[3].

Cancer is a term that includes many pathologies. Thanks to biomedical advances, many types of cancer can be now considered as chronic conditions[4]. Cancer management is complex and require long-life care dealing not only with diagnosis and effective treatment but also with attention to the QoL issues.

From a pure economic perspective, in our previous report ((D1.4, 2020) we provided figures related the economic burden of cancer in Europe. It was stated that, only in Europe, cancer associated costs raise up to "*€126 billion per year".* The deliverable also gathered information related to the annual cost of the informal care, it was reported there that *"is up to 21% of the total medical costs*". In addition to the total cost, we also need to consider the informal care cost and other important aspects ad the loss of productivity, according also to D1.4, "*the total cost of cancer in 2018 was estimated in €199 billion in EU-27 plus Iceland, Norway, Switzerland, and the UK (…), €26 billion for informal care, i.e. 25% of the total expenditure. Social care costs were also estimated, therefore productivity loss accounted for €70 billion, composed of €50 billion due to premature mortality and €20 billion from morbidity".* As mentioned ASCAPE aims at improving QoL of breast and prostate cancer patients. Those two types of cancer account as the two most common cancers in women and men. As it is reported in D1.4 *"breast cancer accounts for 28.7% of the malignancies in women, and prostate accounts for 23.2% in men."* Biomedical and clinical advances in managing those malignancies have contributed to increased rates of survival. It is estimated that in Europe "*at least 80% five-year survival rate. Prostate cancer is the third most common cause of cancer deaths among men across EU countries (particularly among men aged over 65), resulting in more than 75.000 deaths in 2015 and accounting for 10% of all male cancer deaths"* (D1.4, 2020). Therefore, breast and

[2] https://www.euro.who.int/en/health-topics/noncommunicable-diseases/cancer/data-and-statistics#:~:text=Europe%20comprises%20only%20one%20eighth,most%20cancer%20deaths%20each%20year.
[3] https://ec.europa.eu/jrc/en/news/2020-cancer-incidence-and-mortality-eu-27-countries
[4] https://www.cancer.org/treatment/survivorship-during-and-after-treatment/when-cancer-doesnt-go-away.html#:~:text=Cancer%20can%20be%20closely%20watched,chronic%20leukemias%2C%20and%20some%20lymphomas.

prostate cancer have an enormous impact in the healthcare systems, society and patients and relatives.

As it was mentioned, most cancer pathologies have become chronic conditions that requires continuous medical care and ongoing patient care for improving their QoL and avoiding complications and to reduce the risk of long-term complications. Cancer diagnosis, treatment and care are complex and requires a holistic approach, beyond cure, to be addressed. Managing QoL issues and continues care share three important features: i) acute/relapse and chronic phases could alternate during their progress; ii) adequate diagnosis, prognosis and QoL state monitoring require multilevel system medical characterisation; iii) QoL improvement can be improved by patient behaviour.

Care of QoL issues for cancer patients therefore must have the following characteristics: i) continuous between medical appointment and in-home periods; ii) proactive and predictive; iii) consisting of professional care provided by medical personnel and self-management provided by patients themselves; iv) influencing patients' lifestyle; and v) dynamic, meaning that all participants should learn and adapt during the post-acute illness phase focusing on care process and QoL improvement.

Important aspects of QoL management are personalisation, inclusion, and patient empowerment. Personalisation and patient empowerment are closely connected to AI based care approaches. In this regard, the ASCAPE platform AI engines and other advanced machine learning technologies act as enabler of supporting clinicians in remote care provision.

Treatments for QoL issues are supported by AI algorithms implemented in a distributive way while the necessary data and information come from an integrated and unified information space based on HL7 standard.

6.2 eHealth services for managing breast and prostate cancer patients

The provision of eHealth-based services has been challenged for years due to issues such as lack of regulatory frameworks, reimbursement schemes and lack of evidence that ensures a safe and secure adoption of digital medical solutions for healthcare whereas eHealth advantages are clear for those who might need medical delivery but are unable to get it due to lack of resources or limited access[5]. However, eHealth platforms have arisen as an important tool for global management of COVID-19, providing healthcare services, while reduced physical contact. Therefore, eHealth services are increasingly gaining attention in providing not only general care but also specialized care becoming as potential tools for supporting patients. Certainly, although healthcare systems have been lingered in digital adoption, the pandemic has

[5] Bokolo AJ. Exploring the adoption of telemedicine and virtual software for care of outpatients during and after COVID-19 pandemic. Ir J Med Sci (1971-). 2020:1-10. https://doi.org/10.1007/s11845-020-02299-z

triggered the urgency to embrace eHealth services. In few months, healthcare providers rapidly started offerings eHealth services, witnessing a reduction of cost and increase of productivity.

Many healthcare services require face-to-face interaction, but the pandemic has shed the light to those healthcare services that can be provided remotely, such as virtual care and remote patient monitoring. Healthcare leaders are also re-evaluating traditional clinical practice and introducing new complementary services, such as aiding to improve well-being.

Adapting to these shifts, along with myriad others, will require many healthcare organizations to transform their operations—and their mindsets. Past research shows that prioritizing innovation during crises can help unlock growth in the recovery, provided leaders approach it with commitment and establish key capabilities and processes.

6.3 Artificial Intelligence (AI) services for managing breast and prostate cancer patients.

New healthcare methods based on AI rely on a growing volume of medical data on the one hand, and an ever-growing computational power, on the other hand. The data growth is consequently connected with the development of diagnostic and monitoring methods and tools based on AI. All together will provide new decision-making methods and with modelling methods leading to a better implementation of the necessary actions for improving patient outcomes and quality of life.

AI-based services are associated with some benefits such as operational cost reduction, minimizing errors in a medical facility, and increased successful outcomes (Marketwatch, 2021), and they are the basis for supporting personalized medicine.

The real practical implementation of AI based services in real setting are facing some barriers as the lack of medical evidence, liability, regulatory issues, as well as cost-effectiveness evaluation and long-term sustainability.

Therefore, social, clinical, and economic evidence must be demonstrated for defining realistic business models to be built on cost-effectiveness AI-based services

6.4 ASCAPE Value proposition

The overall major objective of ASCAPE is to provide doctors with AI-based services for better managing QoL issues of prostate and breast cancer patients. The project proposes the concept of interoperability, homomorphic encryption, heterogeneous data integration and AI based analytics for gaining holistic and deep knowledge about the factors impacting QoL of the patients and proposing personalized interventions.

ASCAPE aims at providing new medical evidence and insights in managing the QoL based on analysing data for four international cohorts.

AI based applications are increasingly gaining attention in oncological care as potential tools for supporting cancer doctors in managing the complexity of the cancer patients. Although the number of publications and health apps focusing on cancer is increasing, there are still few specifically designed for breast and prostate cancers. Among them, ASCAPE excels as it integrates interoperability, security, and AI support for personalized interventions for a range of QoL issues.

Table 7 Selected e-health applications focused on supporting cancer patients QoL issues.

eHealth Service	Platform	Available in markets	Price	QoL issue	Intervention based on	ASCAPE +
Pit-a-Pat	Android/ iOS	No	Unknown	Mental health/depression	Self-reported	AI supports intervention.
LoseIt!	Android/ iOS	Yes	free/premium	Overweight: food intake and exercise	Self-reported	Personalize intervention based on AI
Interaktor	Unknown	No	Unknown	Symptom and risk assessment for prostate cancer	Self-reported	Focus on QoL issues
Smart After Care	iOS	No	Unknown	Physical activity	Standardized QoL questionnaire + pedometer	Fitbit data collection. AI based support

ASCAPE services will include analytical tools based on AI for knowledge extraction and simulation models will be fed by standardized ASCAPE data. The ASCAPE platform supports secure management for cancer patients with the focus on improving patients QoL. Cancer patients can improve their QoL issues by a healthy diet exercise, phycological support and therapy, but doctors need support in managing their conditions and the complications that follow. QoL issues have been found to be an important marker of poor clinical outcome and mortality among cancer patients.

However, since patient monitoring is time consuming, QoL management needs an intelligent system that supports decisions based on AI recommending interventions and communicates with the hospital information system and with the health record forms of the patient. The AI engines will be fed by data from four different cohorts. While most cohorts are limited to a single organization hospital specialist, hospital unit and they are not able to interoperate even with other EHRs from another hospital service. ASCAPE is providing cross-hospital, cross-country standardized registry of patients' follow-up, providing a common data model for prostate breast cancer patient management.

6.5 ASCAPE The vision

Many patients recovering from cancer usually also develops complications and co-morbidities that are impacting their QoL and must be considered in the management of cancer. The vision of ASCAPE is to provide intelligent services to doctors to help them in managing "the QoL patient". The proposed services entail intelligent feedback to the doctors together with simultaneous sensor monitoring of the patients.

Provision of AI based services to the clinical staff and promoting personalized medicine are fundamental to the successful implementation of the holistic care model. Collaborative, multidisciplinary teams are best suited to provide such care for people with chronic conditions like cancer survivals and to support doctors in managing complex situations involving a myriad of factors. Alterations in reimbursement should reward the provision of quality care. Optimal cancer management is not only centred in the treatment of the pathology but also the comorbidities, adverse effects and overall, the QoL of the patients. That holistic approach requires an organised, systematic methodology supported by the technology and involvement of a coordinated team of dedicated healthcare professionals and ICT experts working in an environment where quality care of the patients is also a priority. ASCAPE like holistic approach in cancer disease management allows streamlining the roles of each stakeholder while at the same time providing them with tailored information for each role and provides, if managed correctly, great opportunities for improved personalized care as well as organisational reorganisation and potentials for cost savings, disrupting the Healthcare Iron Triangle.

6.6 ASCAPE The mission

Around the world healthcare delivery costs have arisen whereas healthcare administration must deal with severe restrictions in their budget. Those facts have been worsened during the last decades by the ageing of developed countries and more recently by the COVID-19 pandemic. It is widely reported and accepted that, the COVID-19 pandemic is not only disturbing economies as well transforming our daily habits but also the way healthcare is provided, triggering, and boosting eHealth-based

services. The ASCAPE mission is boosting AI-based services for helping doctor in providing `patients centred care delivery, personalize interventions and holistic care Therefore, ASCAPE mission is to promote AI-supported services for efficiently and effectively provision of healthcare services including personalized interventions for better health outcomes of patients QoL.

The consortium is not preparing only a theoretical "business models" but the ASCAPE Business plan which will be updated every few months as the projects evolves, it is then an ongoing – a live document. It is not meant only for internal use, but also for discussing business-oriented hypotheses. Therefore, deliverable 5.2 is not a final but a live document with all needed revisions during life cycle of the ASCAPE project based on a future market, industry, and regulatory changes. The outcome of the exploitation activities will be reported in D5.4 due at the end of the project.

6.7 ASCAPE The business offerings

The project is envisaging the potential business trends driven by the foreseen outcomes of the project.

AI-based services for better managing QoL issues

ASCAPE aims at developing an AI-based platform for helping doctors in managing patients QoL interventions. Although the citizens will be the final beneficiaries of the outcomes of the project, ASCAPE business models must be orientated to the healthcare providers. Therefore, the revenue would be provided by hospitals, healthcare providers or insurance companies. Those stakeholders would pay for consultancy, for supporting healthcare delivery, for accessing the AI-based ASCAPE services, but even paying for accurate and aggregated data. In that sense, ASCAPE data-based business might not provide the raw data, but would offer transformed aggregate data, i.e., filtered, accurate and standardized data to researchers and policy makers. Those business models are compatible and could be performed jointly or independently.

AI-based services for helping policy makers.

ASCAPE platform will be eventually useful not only supporting doctors but also for health policy makers. Policy makers are facing the challenge of facing complexity in their decision. Healthcare authorities are in charge of providing policies that fulfil the demand of care in an environment lacking resources. The World Health Organisation (WHO) defines "*public health as all the organised actions and measures for promoting health and preventing diseases among the whole population*"[6]. Therefore, improving quality of life of patients is essential for achieving global health objectives, i.e., avoiding

[6] www.who.int

sedentary habits, have a major impact in public health as well in the economies. Healthcare policies must be based on the evidence as for example banning tobacco consumption and reducing risk of cancer. Public health evidence provides beforehand some insight into the potential correlation of the application of the policy and the expected public health outcomes. Cost-effectiveness evidence provides clues also about the financial burden for both the policy application and the future economic. Evidence must also support health policies in social and public health terms.

6.8 SWOT analysis

The ASCAPE platform is completely focused on the complexity of care provision in addressing QoL issues by providing personalized therapy as well as better integrated care and management of cancer patients, which is in great demand due to the ever-increasing rate of survivals, the aging population, the holistic patient centred approach and the need to contain the cost of healthcare. In this section we analyse the strength and the weaknesses of the ASCAPE platform, and the opportunities and threats presented by the markets and the market factors in relation to a successful exploitation of the ASCAPE platform.

6.8.1 Strengths

The ASCAPE platform is perceived to have the following *strengths*:

- Wearable continuous monitoring devices in closed loop operation based on Fitbit technology for optimum patient comfort and usability.
- Use AI based methods and models for patients monitoring and QoL issues-based control, which will greatly help reducing the risk of developing QoL complications.
- Direct support for compliance schemes between patients and backend combined with AI based models. The aim is to manage “the QoL of the patient” which entails lifestyle education and intelligent feedback to the patient together with simultaneous sensor monitoring.
- Standard data transformation, data management, analysis and, and distributed AI models for decision support.
- Integration with clinical and organisational workflows and external Information Systems.
- The backend knowledge discovery processes implemented using AI engines to provide a smart delivering of eHealth services.
- Trust and security concepts together with security and pseudo-anonymization for trust will be used in application security models.
- Personalisation and patient empowerment are obvious attributes of ASCAPE based solutions and intricately connected to the Quality-of-Life space evolution.

6.8.2 Weaknesses

The ASCAPE platform is perceived to have the following *weaknesses*:

- The ASCAPE platform is a research prototype based on complex AI models that rely on the data acquired during the pilots. Therefore, considerable efforts are needed to transform it into a commercial product, demonstrating medical evidence, compliant with the Medical Device Directive and with national regulations and standards.
- The ASCAPE platform does not provide the healthcare solutions; it merely provides the AI engine for supporting patients in improving their QoL. Applications and services must be evolved to demonstrate medical evidence.
- The eHealth market is very competitive with major players such as IBM, Medtronic, Roche, Philips, etc. working very aggressively.
- Numerous smaller players are already well entrenched in the market for patients support websites and have support from both patients and healthcare providers.

6.8.3 Opportunities

The market for QoL support is perceived to present the following *opportunities*:

- Healthcare services across Europe face massive challenges in the future as the European population is growing older, more and more people have chronic diseases, and the general needs and expectations for efficient and effective healthcare services increase.
- QoL generally needs a system that supports decisions on data, and which communicates with the hospital information system, and also with the health record forms of the patient.
- The demand is for more artificial intelligent supported strategies that extract useful knowledge from continuously monitor patients.
- Care professionals using detailed algorithms have demonstrated great better clinical outcomes. Evidence suggests that these initiatives work best when provided as components of a multifactorial intervention.
- Generally, survival patients need support in managing their condition and the complications that could follow, especially those related to the QoL issues.
- Patients cantered therapies increase adherence to standard of care and educating patients on having better life-styles habits target better QoL goals.

6.8.4 Threats

- Major contributors to suboptimal QoL care are due to facts as health delivery fragmentation (oncologist, therapists, psychologists), suboptimal clinical

guidance protocols, lacks clinical data, lack of information capabilities, poorly designed delivery for continuous care.

- Reluctance for redefining the roles of the clinical staff and promoting self-management.
- Lack of medical evidence for the successful implementation of the AI based therapies.
- The financing and reimbursement schemes for health services vary greatly among the EU Members States; business models and business cases for ASCAPE applications must be tailor-made to every Member State, and few reimbursement schemes for eHealth services are already fully implemented.

6.9 Possible exploitation strategies

In defining the possible exploitation strategies, we intend to use the strengths of the ASCAPE platform to exploit the opportunities in the market and alleviate the threats. We also intend to develop strategies to prevent the weaknesses of the ASCAPE platform from impacting our ability to exploit the market opportunities and from the threats posed by the market. The result is provided in Table 8.
Overall, the ASCAPE whole platform will be based on open-source licencing, but a premium modality could be offered. Any case, the direct selling to the users is not foreseen, so the business model will be to selling to hospitals or insurance companies, i.e. A B2B model. Building a B2B business model in mHealth is more complex than in B2C, but is likely to be more rewarding, especially in a highly regulated market. The commercial roadmap of the platform will be provided in D5.5 at the end of the project.

Table 8 Resulting options from the SWOT analysis.

	Strength	Weaknesses
Opportunities	Develop ASCAPE AI-based applications for decision support and QoL management. Develop high performance and robust Remote Patient Monitoring applications for cancer survivals and co-morbidity management in the primary care sector Develop Self-management applications, decision support, risk assessment, compliance, and event handling	Make sufficient IPR protection so that essential ASCAPE technologies cannot be copied by the big players. Provide the ASCAPE platform as private cloud services (Software as a Service) Develop effective applications based on the Open Call that allows for rapid development and deployment of commercial healthcare applications and services
Threats	Use the Unique Selling Points to position the ASCAPE platform as an alliance partner for the established big players in the market. Develop sustainable business models that provide attractive ROI for all stakeholders in the healthcare system, including patients. Make sure that all commercial applications are developed based on real user demands	Make sufficient IPR protection for commercial ASCAPE products so that essential technologies cannot be copied by the big players. Make commercialisation of products and services in small steps to avoid overload of organisations and decision makers. Accept that research prototypes need to be drastically improved to meet real-life demand

6.10 ASCAPE: Individual Identified Assets

At this stage of the project the ASCAPE platform is evolving as the different components have been developed and it is expected they will be refined and improved, especially as results of the pilots' outcomes. In that sense, an update version of this deliverable will be provided at the end of the project. That version will be focused on the ASCAPE platform commercialization strategies based on thoroughly market analysis. This current version of the exploitation activities is therefore orientated at defining the individual exploitation plans for the current

identified assets of the project. As results of the activities carried out by the partners several individual activities have been performed and a few outcomes are identified. Some of those outcomes have the potential of being considered assets, in other words have enough entity for being considered for individually exploitation, independently they are part of the ASCAPE proposed solution. The features of those individual assets are depicted in this section aiming at providing a vision of their functionalities, their potential dependencies from other assets as well the IPRs and licences that could impact the business strategies.

All the partners were asked to identify and describe their assets and potential competitors if any in the following tables:

6.10.1 Simulation software by DFKI

Table 9 Simulation description

Simulations	
Short description of the SW component developed by your organization	Library that allows to determine and rank intervention effects on QoL issues based on available local and global models to predict QOL issues
Input of the component	Local and global models to predict QOL issues, the training datasets the models have been trained on and a patient data for which predictions have been made.
Output of the component	List of interventions with the effect on QOL issues
Describe the target customer segments/user groups of your component	This is an internal functionality of the ASCAPE edge and cloud systems.
Key features and benefits of your component	See short description above.
Essential information for potential users (requirements, use restrictions, etc.)	Not applicable.
Standards involved in the development of your component	Scikit-learn library (https://scikit-learn.org/stable)

Simulations	
Has your component synergies with other component regarding exploitation? Please, identify which one	Only in concert with all other components of ASCAPE edge and cloud components.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	Exploitation is planned by providing it as an open-source component together with the other ASCAPE components (edge/cloud) and for use in future R&D projects.

6.10.2 Explainable AI by DFKI

Table 10 Explainable AI description

Explainable AI	
Short description of the SW component developed by your organization	Explainable AI components provide explanations about AI models and their predictions.
Input of the component	Training Dataset,
Output of the component	Surrogate Models: Interpretable AI models trained to produce similar predictions as the regular models. Feature Attribution: Measurement of how each individual feature contributed to a certain prediction.
Describe the target customer segments/user groups of your component	The users of the ASCAPE platform, that are the patients and healthcare personnel.
Key features and benefits of your component	Provides a set of explainable AI techniques to the users of AI services. This makes AI services more trustable and increases acceptance by the target group.
Essential information for potential users (requirements, use restrictions, etc.)	NA
Standards involved in the development of your component	SHAP-framework (Link), Scikit-learn library (https://scikit-learn.org/stable)

Explainable AI	
Has your component synergies with other component regarding exploitation? Please, identify which one	Only in concert with all other components of ASCAPE edge and cloud.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	Exploitation is planned by providing it as an open-source component together with the other ASCAPE components (edge/cloud) and for use in future R&D projects.

Table 11 Competitors and Trends

Competitor 1: AI Explainability 360	
Short description	Open-source toolkit providing different sets of techniques for explainable and transparent AI.
Developed by	IBM Research
Type of License: Open Source or proprietary	Apache-2.0
Business Models (free, license, pay per use, etc.)	free
Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	Support for Surrogate Models, Support for use in privacy-preserving federated learning context. All functionality is model agnostic.
Explain what the minus of your component in relation to the competitor is	Less generic techniques available.

6.10.3 Fitbit Data Adapter by Ubitech

Table 12 Fitbit Data Adapter description

Name of the SW Component 1: Fitbit Data Adapter	
Short description of the SW component developed by your organization	Fitbit data adapters will collect device data for the patients to be transmitted to ASCAPE or updating the ASCAPE Edge Node. Through the same tool it will be possible to start monitoring the corresponding devices, as well as stop monitoring by removing the device from the list.
Input of the component	Information identifying each of the devices, POST start/stop monitoring messages.
Output of the component	The component will retrieve and return to the ASCAPE Device Data Synchroniser the wearable data collected for the specific device for the requested time frame
Describe the target customer segments/user groups of your component	The Fitbit Data Adapter is primarily used by demonstrators and data provider partners of the ASCAPE Action. However, the abstracted and unified API that is offered can be explored by such data providers and can be used for data acquisition from other data sources.
Key features and benefits of your component	The Fitbit Data Adapter offers an abstracted and unified API capable of supporting the data acquisition of a variety of data sources and data providers like healthcare organizations, IoT devices or sensors, web platforms, and more. To support this, the Fitbit Data Adapter offers a dynamic configuration setup in order to establish connections and communications for data acquisition Fitbit smartwatch. The Fitbit Data Adapter supports both pulling data from Fitbit and data being pushed to the ASCAPE platform.
Essential information for potential users (requirements, use restrictions, etc.)	n/a

Standards involved in the development of your component	n/a
Has your component synergies with other component regarding exploitation? Please, identify which one	ASCAPE Data Enricher, open weather data base
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	Since the component is market agnostic UBITECH will use this know-how acquisition in future research projects.

6.10.4 Weather Data Adapter by Ubitech

Table 13 Weather Data Adapter description

Name of the SW Component 2: Weather Data Adapter	
Short description of the SW component developed by your organization	ASCAPE weather data adapter is a software component that will send open cloud-based weather data that will be used as an additional determinant.
Input of the component	Area and period for which weather data are to be obtained.
Output of the component	Summary weather information for the specified area.
Describe the target customer segments/user groups of your component	The Weather Data Adapter is primarily used by demonstrators and data provider partners of the ASCAPE Action. However, the abstracted and unified API that is offered can be explored by such data providers and can be used for data acquisition from other data sources.
Key features and benefits of your component	The Weather Data Adapter offers an abstracted and unified API capable of supporting the data acquisition of a variety of public open data sources. To support this, the Weather Data Adapter offers a dynamic configuration setup to establish connections

	and communications for data acquisition from various open databases.
Essential information for potential users (requirements, use restrictions, etc.)	n/a
Standards involved in the development of your component	n/a
Has your component synergies with other component regarding exploitation? Please, identify which one	ASCAPE Device Data Synchroniser, Fitbit smartwatch
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	Since the component is market agnostic UBITECH will use this know-how acquisition in future research projects.

6.10.5 Edge AI Models Manager by UNSPMF

Table 14 Edge AI Models Manager description

Edge AI Models Manager	
Short description of the SW component developed by your organization	Edge AI Models Manager trains and internally validates local and global (federated) predictive models based on classification and regression machine learning algorithms.
Input of the component	Training dataset in the CSV format. The last column is the target variable, all previous columns are predictor variables.
Output of the component	Local and global (federated) predictive models
Describe the target customer segments/user groups of your component	Individuals, organizations and companies having training datasets for training predictive machine learning models
Key features and benefits of your component	The component supports both classification-based and regression-based machine learning models. It enables both non-

	collective and collective learning of machine learning models.
Essential information for potential users (requirements, use restrictions, etc.)	No use restrictions: open-source component. The component minimally requires a standard PC with an i5 processor and 8-16 GB of RAM memory.
Standards involved in the development of your component	The component is implemented in Python following common object-oriented development practices and relying on reliable Python machine libraries (Tensorflow and Scikit-learn).
Has your component synergies with other component regarding exploitation? Please, identify which one	The component can be used independently from other components when training local models. For training federated machine learning models, it is necessary to internally deploy or have an access to external Cloud Federated Learning Coordinator (for training federated models) and ASCAPE AI Knowledge Manager (for storing federated models).
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	The component can be exploited alone for training models for datasets coming from one data source. For collective learning its exploitation requires Cloud Federated Learning Coordinator and ASCAPE AI Knowledge Manager.

6.10.6 Cloud Federated Learning Coordinator by UNSPMF

Table 15 Cloud Federated Learning Coordinator description

Name of the SW Component 2: Cloud Federated Learning Coordinator	
Short description of the SW component developed by your organization	Cloud Federated Learning Coordinator coordinates the process of federated learning initiated by Edge AI Models Manager components deployed at various edge nodes
Input of the component	Machine learning models
Output of the component	Federated machine learning models

Describe the target customer segments/user groups of your component	Individuals, organizations and companies having training datasets for collective training of federated machine learning models
Key features and benefits of your component	Two federated learning modes are supported: incremental and semi-concurrent. The federated learning process is not predetermined to any of those modes but dynamically adapted in time according to active edge nodes.
Essential information for potential users (requirements, use restrictions, etc.)	No use restrictions: open-source component. The component minimally requires a standard PC with an i5 processor and 8-16 GB of RAM memory.
Standards involved in the development of your component	The component is developed in Python following common object-oriented development practices and relying on reliable Python machine libraries (websockets and asyncio for communication based on websockets with edge nodes).
Has your component synergies with other component regarding exploitation? Please, identify which one	The component cannot be used without Edge AI Models Manager because its main purpose is to enable collective training for multiple edge nodes running Edge AI Models Manager. Also, it requires ASCAPE AI Knowledge Manager which stores its outputs.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	This component cannot be exploited without Edge AI Models Manager and ASCAPE AI Knowledge Manager. Those three components together enable federated learning of predictive machine learning models.

6.10.7 ASCAPE AI Knowledge Manager by UNSPMF

Table 16 ASCAPE AI Knowledge Manager description

Name of the SW Component 3:	**ASCAPE AI Knowledge Manager**
Short description of the SW component developed by your organization	Cloud Federated Learning Coordinator

Input of the component	Federated machine learning models
Output of the component	A database of JSON serialized federated machine learning models
Describe the target customer segments/user groups of your component	Individuals, organizations and companies interested in predictions by federated machine learning models
Key features and benefits of your component	The component enables storing and retrieval of federated machine learning models for all interested parties, not only for those that participated in federated learning
Essential information for potential users (requirements, use restrictions, etc.)	No use restrictions: open-source component. The component minimally requires a standard PC with an i5 processor, 8-16 GB of RAM memory and 300GB hard drive.
Standards involved in the development of your component	The component is implemented in Python following common object-oriented development practices and relying on reliable Python machine libraries (peewee as ORM for SQLite and PostgreSQL database).
Has your component synergies with other component regarding exploitation? Please, identify which one	The component cannot be used without Edge AI Models Manager and Cloud Federated Learning Coordinator, because its main purpose is to store and enable retrieval of machine learning models resulting from collective learning.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	This component cannot be exploited without Edge AI Models Manager and ASCAPE AI Knowledge Manager. Those three components together enable federated learning of predictive machine learning models.

6.10.8 Edge AI Prediction and Simulation Manager by UNSPMF

Table 17 Edge AI Prediction and Simulation Manager description

Name of the SW Component 4: Edge AI Predictions and Simulations Manager	
Short description of the SW component developed by your organization	This component enables inference (making predictions) by local and global (federated) machine learning models.
Input of the component	Prediction requests
Output of the component	Predictions by machine learning models internally stored in a database
Describe the target customer segments/user groups of your component	Individuals, organizations and companies interested in predictions by federated machine learning models
Key features and benefits of your component	The component enables predictions by both local and global (federated) models taking into account their accuracy levels
Essential information for potential users (requirements, use restrictions, etc.)	No use restrictions: open source component. The component minimally requires a standard PC with an i5 processor and 8-16 GB of RAM memory.
Standards involved in the development of your component	The component is implemented in Python following common object-oriented development practices and relying on reliable Python machine libraries (Tensorflow and Scikit-learn).
Has your component synergies with other component regarding exploitation? Please, identify which one	The component requires an access to Edge AI Models Manager for making predictions by local models (to retrieve local models) and ASCAPE AI Knowlege manager for making predictions by global (federated) models (to retrieve global models).
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	This component cannot be exploited either without Edge AI Models Manager for making predictions by local models or ASCAPE AI Knowledge Manager for making predictions by global models (at least one is required).

Table 18 Competitors and Trends

Competitor 1: Tensorflow	
Short description	Tensorflow is a deep learning framework for learning predictive machine learning models based on neural networks
Developed by	Google
Type of License: Open Source or proprietary	Open source (Apache Licence 2.0)
Business Models (free, license, pay per use, etc.)	Free
Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	Edge AI Models Manager besides learning of local models enables also learning of federated models. It additionally supports a wide spectrum of machine learning models (not only neural networks)
Explain what the minus of your component in relation to the competitor is	Maturity, the development of Edge AI Models Manager started with the ASCAPE project.

Competitor 2: Tensorflow Federated	
Short description	Tensorflow Federated is a framework for federated machine learning based on the Tensorflow framework.
Developed by	Google
Type of License: Open Source or proprietary	Open source (Apache Licence 2.0)
Business Models (free, license, pay per use, etc.)	Free

Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	Cloud Federated Learning Coordinator supports incremental and semi-concurrent federated learning. The federated learning mode is not specified in advance, but dynamically adapted in time.
Explain what the minus of your component in relation to the competitor is	Maturity, the development of Cloud Federated Learning Coordinator started with the ASCAPE project.

Competitor 3: Tensorflow Hub	
Short description	Tensorflow Hub is a heterogenous database of available Tensorflow models
Developed by	Google
Type of License: Open Source or proprietary	Open source (Apache Licence 2.0)
Business Models (free, license, pay per use, etc.)	Free
Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	ASCAPE AI Knowlege Manager enables retrieval of model metadata that are specific for federated machine learning models.
Explain what the minus of your component in relation to the competitor is	Maturity, the development of ASCAPE AI Models Manager started with the ASCAPE project.

Competitor 4: Tensorflow Lite	
Short description	Tensorflow Lite is an inference engine for Tensorflow models

Developed by	Google
Type of License: Open Source or proprietary	Open source (Apache Licence 2.0)
Business Models (free, license, pay per use, etc.)	Free
Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	Edge AI Predictions and Simulations Manager provides inference engine for local models that are not Tensorflow-based. It also enables simulations driven by predictions obtained by heterogeneous inference engines.
Explain what the minus of your component in relation to the competitor is	Maturity, the development of Edge AI Predictions and Simulations Manager started with the ASCAPE project.

6.10.9 Health Suite by Atos

Table 19 Health Suite description

Name of the SW Component 1: Health Suite	
Short description of the SW component developed by your organization	Provides transformation into HL7, storage and management of clinical data into a FHIR data
Input of the component	Clinical data, REST API calls
Output of the component	FHIR data, REST API responses
Describe the target customer segments/user groups of your component	HIS Systems, Administrator of the System
Key features and benefits of your component	Interoperability

Essential information for potential users (requirements, use restrictions, etc.)	Definition of the ASCAPE data model of reference
Standards involved in the development of your component	OpenAPI Specification
Has your component synergies with other component regarding exploitation? Please, identify which one	It depends on the data model of reference but can easily adapted to other data model
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	Interoperability related consultancy and services

Table 20 Competitors and Trends

Competitor 1: Microsoft FHIR Converter	
Short description	ease the task of FHIR transformation such as Microsoft FHIR Converter. https://github.com/microsoft/FHIR-Converter
Developed by	Microsoft
Type of License: Open Source or proprietary	Proprietary
Business Models (free, license, pay per use, etc.)	Licences
Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	The health suite is adapted to the requirements of the user..
Explain what the minus of your component in relation to the competitor is	Microsoft

Competitor 2: Firely	
Short description	Firely provides some kind of the software, training and services for implementing FHIR https://fire.ly/
Developed by	Firely
Type of License: Open Source or proprietary	Propietary, consultancy
Business Models (free, license, pay per use, etc.)	Consultant fees
Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	Allows customization and inclusion of medical terminology based on SNOMED-CT.
Explain what the minus of your component in relation to the competitor is	Use of FHiR profiles using Forges

Competitor 3: CAMP FHIR	
Short description	https://github.com/NCTraCSIDSci/camp-fhir CAMP FHIR is application intendents to transform clinical data stored in a relational database to HL7's Fast Healthcare Interoperability Resources..
Developed by	NC TraCS Institute at University of North Carolina at Chapel Hill
Type of License: Open Source or proprietary	Open source
Business Models (free, license, pay per use, etc.)	Free

Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	The Health Suite allows the customization based on the clinical needs
Explain what the minus of your component in relation to the competitor is	Provides an scripts that might facilitate the service.

6.10.10 Method for operating on encrypted data by Siemens.

Table 21Simple Encrypted Arithmetic Library description

Name of the SW Component 1: Encoding method for real numbers to be used in algorithms operating on homomorphically encrypted data	
Short description of the SW component developed by your organization	The component contains an encoding method that allows for homomorphic operations on encrypted real values by using the polynomial representation of a number. Methods for addition, subtraction, multiplication, matrix operations (using encoded and encrypted values) and decoding are also developed.
Input of the component	A real number (or a matrix of real numbers)
Output of the component	An encoded version of the number (or a matrix containing the encoded versions of the numbers from the input matrix)
Describe the target customer segments/user groups of your component	Health clinics or hospitals that may want to preserve their patients' privacy when they send personal data to a third party for further processing.
Key features and benefits of your component	As most homomorphic encryption schemes allow only for the encryption of small positive integers, the encoding method extends their usability by enabling real numbers and negative numbers encryption. Also, it allows for homomorphically encrypted addition,

	subtraction and multiplication between real numbers.
Essential information for potential users (requirements, use restrictions, etc.)	Considering the particularities of the encoding method, data should be normalized before the encoding, to avoid the plaintext exploding effect. Data cannot be used in applications that involve division between encrypted numbers. The user should take into account a trade-off between computational accuracy and computational cost.
Standards involved in the development of your component	N/A
Has your component synergies with other component regarding exploitation? Please, identify which one	N/A
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	To ensure the security of the data in real-world applications (e.g., using a machine learning-based technique) the encoding method should be used in combination with a homomorphic encryption scheme.

Table 22 Competitors and Trends

Competitor 1: Simple Encrypted Arithmetic Library (SEAL)	
Short description	Provides a set of encryption libraries with support for the BFV scheme and the CKKS scheme, allowing for mathematical operations to be performed on encrypted data.
Developed by	Microsoft
Type of License: Open Source or proprietary	open-source (MIT license)
Business Models (free, license, pay per use, etc.)	Free

Explain what the bonus (features, status, business model, etc.) of your component in relation to the competitor is	SEAL also supports floating-point numbers, but in order to do so, it takes advantage of a property of the CKKS scheme that affects the precision of the computation. The encoding method can ensure zero loss in precision. Moreover, the number of operations that can be performed with ciphertexts is limited when using SEAL because of the noise introduced through homomorphic operations. The encoding method can be used in combination with HE schemes that don`t introduce noise. SEAL is homomorphic for addition and multiplication, while the encoding method also enables subtraction.
Explain what the minus of your component in relation to the competitor is	While SEAL provides a simple and convenient API, the use of the encoding method requires some understanding of the mathematics underlying the encoding and encryption. It also requires data normalization and the choice of a suitable precision parameter for a certain application, in order to achieve zero loss in precision. SEAL is one of the fastest HE libraries, while the encoding introduces an computational overhead.

6.10.11 ASCAPE Dashboard by INTRA

Table 23 ASCAPE dashboard description

ASCAPE Dashboard	
Short description of the SW component developed by your organization	The ASCAPE Dashboard is a web-based application for doctors allowing them access to ASCAPE Visualisations (produced by the ASCAPE Visualisation Library) and enabling them, in addition to receiving intervention suggestions by the ASCAPE AI, to explore the predicted effects of different interventions on their patient's QoL.

Input of the component	Historic data, plus AI results from the ASCAPE Edge Node, obtained via an HTTP REST JSON interface.
Output of the component	A web-based User Interface for doctors on a browser allowing them to access ASCAPE visualisations, try different intervention scenarios and provide the minimal input required by ASCAPE (primarily: the interventions they recommended to their patients).
Describe the target customer segments/user groups of your component	This is the ASCAPE UI for Doctors. It is to be used as-is in two of the pilots, whereas in the remaining two, its visualisation functionality (as embodied in the standalone ASCAPE Visualisations Library on which the ASCAPE Dashboard is also built) will be integrated inside the systems ordinarily used by hospital doctors.
Key features and benefits of your component	The Dashboard is an easy-to-deploy solution for offering access to ASCAPE visualisations to doctors. The UI focuses on presenting information to doctors in an easy-to-comprehend manner, avoiding information overload via intelligent prioritisation of visualisations, as well as allowing experimentation with different intervention scenarios and offering ways for the AI recommendations and predictions to be explained to doctors.
Essential information for potential users (requirements, use restrictions, etc.)	The ASCAPE Dashboard is a tool for doctors. It requires a functioning ASCAPE Edge Node as a prerequisite where the doctors' accounts will need to be set up (specifically: on the ASCAPE Edge Node Gatekeeper). The ASCAPE Visualisation Library on which the ASCAPE Dashboard is based as well as

	the Dashboard itself are both open-sourced allowing developers to re-use parts of them, create branches, or merely inspect the code either for security validation purposes or in order to facilitate their efforts in building alternative visualisations and/or an alternative to the ASCAPE Dashboard (including integrating its functionality within an existing system as will be done in the case of two of the four pilots).
Standards involved in the development of your component	.net 5.0, HTML 5, Javascript/ECMSScript 5, CSS 3
Has your component synergies with other component regarding exploitation? Please, identify which one	In INTRA's view and exploitation plans, the scenario of integrating ASCAPE with an existing Healthcare Information System is better served by the ASCAPE Visualisation Library, yet there could be cases where the ASCAPE Dashboard, as-is or customised, may serve the purposes of a specific exploitation scenario. In that case, it is expected to be exploited in conjunction with a full Edge-Cloud deployment or an Edge Node at the very least. This is because the ASCAPE Dashboard obtains the data it visualises from an ASCAPE Edge Node and sends finalised doctor's interventions suggestions to a patient to it also.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	The library as-is is custom-made for ASCAPE and requires an ASCAPE Edge Node at minimum.

6.10.12 ASCAPE Visualisation Library by INTRA

Table 24 ASCAPE Visualization Library description

ASCAPE Visualisation Library	
Short description of the SW component developed by your organization	The ASCAPE Visualisation Library is an open source visualisation library purpose-built for providing visualisations of ASCAPE historic data and AI results.

Input of the component	Historic data, plus AI results from the ASCAPE Edge Node, obtained via an HTTP REST JSON interface.
Output of the component	Visualisations inside an HTML page on a browser.
Describe the target customer segments/user groups of your component	This is a front-end web library (JS and CSS) meant to be used by developers of systems that aim to integrate them with the ASCAPE Platform.
Key features and benefits of your component	Offering a stand-alone library in addition to the ASCAPE Dashboard, facilitates integration with existing systems.
Essential information for potential users (requirements, use restrictions, etc.)	The ASCAPE Visualisation Library has been constructed in a manner that will allow it to be compatible with the vast majority of web-based applications. For the minority of cases of web-based applications where incompatibilities prohibit the use of this library and for cases of non-web-based applications, the ASCAPE Visualisation Library and its documentation can serve to guide the development of suitable alternative visualisation methods.
Standards involved in the development of your component	HTML 5, Javascript/ECMSScript 5, CSS 3
Has your component synergies with other component regarding exploitation? Please, identify which one	The ASCAPE Visualisation Library is dependent on the existence of a web application backend which obtains and forwards results from an ASCAPE Edge Node.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	The library as-is is custom-made for ASCAPE and requires an ASCAPE Edge Node at minimum.

6.10.13 ASCAPE Device Data Synchroniser by INTRA

Table 25 ASCAPE Device data Synchronizer description

ASCAPE Device Data Synchroniser	
Short description of the SW component developed by your organization	The ASCAPE Device Data Synchroniser connects with device data adapters exposing an ASCAPE-compatible API and makes the data from these available to the Redacted Patient Data Manager on a regular basis or to other components on a per-request basis. It also maintains a mapping between ASCAPE Ids of patients and device ids and/or accounts, thus allowing all other components within the Edge Node to not be aware of a patient's device/account id in order to obtain data from their device.
Input of the component	The mapping between patient ASCAPE ids and device/account ids is controlled by appropriately authorised calls to establish or sever a link between them (e.g. initiated through UI actions on the Dashboard by authorised doctors). Requests for device data use the ASCAPE patient id and the component forwards them to the appropriate device data adapter using the corresponding device/account id. The synchroniser may additionally be configured to update another component (in accordance with the architectural design, the Redacted Patient Data Manager) with data from the device data adapters.
Output of the component	The component, depending on how it is used, may return data from data adapters on demand, or post such data to a given endpoint on regular intervals (with both the endpoint and the interval being specified in a configuration file).
Describe the target customer segments/user groups of your component	This is an integration-focused internal component of the Edge Node. In conjunction with external ASCAPE-compatible device

	data adapters it provides a means for data for devices such as wearable smart bracelets to be take into consideration by ASCAPE.
Key features and benefits of your component	The component is device-agnostic. Device data adapters can be implemented for different types of device without modifying the ASCAPE Edge Node code.
Essential information for potential users (requirements, use restrictions, etc.)	The device data adapters meant to be used by an Edge Node must be reachable in order for the necessary communication to take place.
Standards involved in the development of your component	.net 5.0, TCP/IP, REST, JSON, HTTP, TLS
Has your component synergies with other component regarding exploitation? Please, identify which one	The component relies on input (REST requests) in order to maintain the association between ASCAPE ids and device / account ids; these may be sent by the Dashboard or a Hospital Information System. The component also relies on the availability of one or more appropriate ASCAPE-compatible data adapters. The FitBit Adapter by UBITECH is an example of such an adapter.
Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	The most natural route for exploiting this component is as part of the Edge Node. It is also reliant on the existence of one or more external device data adapters.

6.10.14 ASCAPE Data Enricher by INTRA

Table 26 ASCAPE Data Enricher description

ASCAPE Data Enricher

Short description of the SW component developed by your organization	The ASCAPE Data Enricher intercepts messages including enrichment requests, fulfils these requests and replaces them with the relevant data and forwards the updated messages to their ultimate destination (the Redacted Patient Data Manager).
Input of the component	The component's inputs are messages which include an ASCAPE id, a message payload, and one or more enrichment requests.
Output of the component	The component's output are messages, which include an ASCAPE id, a message payload, both copied from the input message, and the fulfilment of the input message's enrichment requests.
Describe the target customer segments/user groups of your component	This is an integration-focused internal component of the Edge Node. In conjunction with external ASCAPE-compatible weather data and other open-data adapters it provides a means for data for patient data from, say, a hospital information system to be enriched with, for instance, weather data without the hospital information system being modified to incorporate such data.
Key features and benefits of your component	The component is device-agnostic. Open data adapters can be implemented for different types of open-data sources without modifying the ASCAPE Edge Node code.
Essential information for potential users (requirements, use restrictions, etc.)	The open-data adapters meant to be used by an Edge Node must be reachable in order for the necessary communication to take place.
Standards involved in the development of your component	.net 5.0, TCP/IP, REST, JSON, HTTP, TLS
Has your component synergies with other component regarding exploitation? Please, identify which one	The component relies on the availability of one or more open-data adapters. The Weather Data Adapter by UBITECH is an example of such an adapter.

Do you envision an exploitation strategy for your component alone or along with another one? If so, explain which one, and if not, why.	The most natural route for exploiting this component is as part of the Edge Node. It is also reliant on the existence of one or more external device data adapters.

6.11 Individual exploitation plans, sustainable expectation, and interests

The designing and development of a tailored exploitation plan is a continuous task within an RIA project such as ASCAPE. At the early stages of the project, a template was circulated to all partners to help them identify their exploitable assets, their interests, and sustainability expectations and define in detail their exploitation strategy. The most advanced individual exploitation plans are listed in the following subsections (Sections 6.11.1 – 6.11.9).

6.11.1 UBITECH individual exploitation plans and sustainability expectations.

Table 27 UBITECH Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	Asset #1. UBITECH through its participation in Task2.1 will implement the Fitbit data adapters. This module aims at collecting device data from the patients to be transmitted to ASCAPE or updating the ASCAPE Edge Node, as well as at managing the smart device itself. Asset #2. UBITECH also through its participation in Task2.1 will implement the Weather Data Adapter. This module aims at sending open cloud-based weather data that will be used as an additional quality of life indicator and intervention determinant.
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	UBITECH is a leading, highly innovative software house, systems' integrator, and technology provider, established to provide leading-edge intelligent technical solutions and consulting services to businesses, organizations, and government in order to allow efficient and effective secure access and communication with various heterogeneous information resources and services based on experience, technological know-how acquired. Based on our profile and the artifacts we develop, ASCAPE is perfectly aligned with the

	strategic goals of the company to expand its product and service portfolio based on big data technologies through the offering of integration and interoperability of IT solutions and apply its research results to solve problems like these dealt with by the ASCAPE Action in the broader healthcare sector such as e/m-Health, ambient assisted and independent living. This way we consider that we will increase our competitiveness, targeting both the public and private sectors and especially the industry.
What are your intentions for the components that you are developing regarding IPR and licensing?	Both Data adapters (TRL6) will be released as Open Source, in order to give access to multiple developers and stakeholders for configuring or upgrading it according to their current needs. Collaboration with other partners is envisioned to jointly exploit this asset.
What has been your individual exploitation roadmap during the project?	UBITECH, especially as the leader of WP5, is already leveraging the experience and know-how gained under the ASCAPE Action to apply for research projects and is already working internally to adapt the developed framework for other relevant applications in the broader healthcare sector as well as in other areas of big data. In addition, UBITECH has promoted at various events not only its contributions but also the entire integrated ASCAPE platform.
What is your exploitation plan after the project lifetime?	The Exploitation strategy of UBITECH is based on the following items: 1. Integration of ASCAPE data adapters (smart watch data, weather data) in existing or new big data solutions in other fields 3. Use of know-how acquired in the field of Big Data for the design and development of new products and services 2. Transfer of the know-how acquired in new research activities both national and European.

What key outcomes/SW components do you see as having more value for creating impact routes for the consortium besides the ASCAPE platform?	All ASCAPE solutions are based on known technologies with a proven value proposition. However, the most significant competitive advantage of ASCAPE is its concept, where the Quality of Life of patients is holistically addressed. ASCAPE acts as a platform tool that can be tailored and adapted to the needs of patients, leading to scalable solutions and broader adoption of eHealth applications
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	The European Union has around 15,000 hospitals, which account for 25% to 60% of each country-wide health budget, without mentioning pharmacists or private doctors. Moreover, the cancer supportive care products market is expected to gain market growth in the forecast period up to 2028. The people who can make decisions about the provision of ASCAPE platform are General Managers, Hospital Infrastructure Managers, Chief Information Systems Officers, Security Managers, Financial Managers, Regional Managers and so forth. As a result, we must developed a comprehensive strategy to present the value proposition of ASCAPE platform to the potential customers.
What academic (education or research) opportunities do you see for the consortium in general?	While some of the ASCAPE outcomes have the potential to be brought to the market in the near future, others require additional research or have created the conditions for new internal research projects. Such products are suitable for scientific exploitation. These results should be eligible as the basis for future publications. Furthermore, the Clinical perspectives of the ASCAPE Action and the results of the requirements elicitation process could be the main focus of open scientific lectures or can also be used to enrich part of MSc programmes.

What opportunities do you identify for the Open Source Approach?	Open Source software offers significant potential for consultancy services by which the ASCAPE components can enter an application development life-cycle (SDLC) suitable for commercial exploitation. Besides, Open Source also gives the chance to sustain the ASCAPE's results through its transfer into new Open Source projects on social development hubs like GitHub, GitLab, bitbucket, and so forth. Another way could be the involvement of an essential number of developers to sustain the project's results without any recurring costs.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	Beyond commercialization opportunities, UBITECH would be interested in setting up standardization efforts and initiatives for ASCAPE results. Based on our past involvement in Technical Committees, we consider that standardization efforts will provide ASCAPE with the opportunity of disseminating its technological know-how and at the same time to acquire significant experience and knowledge in specific scientific fields and technological areas.
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	Given that UBITECH is one of the most dynamically developing IT companies in Greece, UBITECH would be very interested in bringing the ASCAPE platform to a position that could be commercially exploited as an integrated solution. In this case, UBITECH would not only be interested in contributing in scientific and technological terms but also in providing its market-proven business innovations.

6.11.2 Atos individual exploitation plans and sustainability expectations.

Table 28 ATOS exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the	Atos has developed, customized and set up the data transformation process into FHIR,

assets of the project, explain your participation in ASCAPE project	the storage of FHIR data and the transformation of JSON files to CSV.
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	Atos is a leading player in the healthcare sector where Atos has identified interoperability as a major barrier for eHealth services.
What are your intentions for the components that you are developing regarding IPR and licensing?	Atos will release the health suite as open-source license.
What has been your individual exploitation roadmap during the project?	Exploitation of Atos assets will be based on a open/source. Atos plans to offer its interoperability services as consultancy business.
What is your exploitation plan after the project lifetime?	The successful implementation of ASCAPE will be the support of the exploitation plan to be defined at the end of the project.

What key outcomes/SW components do you see as having more value for creating impact routes for the consortium besides the ASCAPE platform?	The ASCAPE Platform as a whole. Individual exploitation issues as homomorphic encryption, interoperability and AI based services for QoL issues intervention
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	Demonstrating evidence and cost-effectiveness of the AI -based support to doctors caring for breast cancer and prostate cancer patients dealing with QoL issues related to their cancer type and its treatment. models at the end of the project will also be a valuable asset. The ASCAPE business plan will need to balance commercialization and infrastructure sustainability needs with

	the aim of low barriers to the use of both the Cloud and of the ASCAPE models.
What academic (education or research) opportunities do you see for the consortium in general?	The outcomes of ASCAPE might set up the basis for future research in OoL issues for other types of cancers.
What opportunities do you identify for the Open Source Approach?	The Open call will be providing insights and will be supported by the Open Source approach. The business model will be based on providing service provision. Product enhancement is another commercial opportunity.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	Atos is interested in joining a Sustainability Body for the ASCAPE Platform and contributing towards both technical and business decision-making in line with its role in the project and its commercial presence in the health IT sector.

6.11.3 DFKI individual exploitation plans and sustainability expectations.

Table 29 DFKI Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	DFKI contributes to ASCAPE by bringing in it's expertise in machine learning and explainable artificial intelligence. It is mainly developing the components for simulations to determine and rank intervention effects on QoL issues based on available local and global models to predict QoL issues as well as the explainable AI components to provide explanations about AI models and their predictions.
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your	The assets created for ASCAPE are fully aligned with the research and development activities of DFKI in the area of machine

organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	learning methods and applications, and especially improving the r eliability and explainability of Machine Learning techniques. The expertise gained through the development and evaluation of these assets will further improve is expertise in this domain and enable to engage in further research projects or gain industry contracts, especially, but not only, in the health and care domain.
What are your intentions for the components that you are developing regarding IPR and licensing?	DFKI aims at releasing all its developed components under an open-source license compatible with open-source licenses of assets provided by other partners of ASCAPE in order to foster the uptake of the ASCAPE system by third parties.
What has been your individual exploitation roadmap during the project?	Knowledge and expertise gained in the project are shared in the research department to distribute the expertise internally. DFKI being a non-profit research institute on Artificial Intelligence, its exploitation is primarily scientific by publishing results in high-quality academic conferences and journals. As publication in such venues requires mature and evaluated results, this is mainly foreseen in the second part of the projects. Thus far DFKI has been contributing to publications on the ASCAPE goals and concept.
What is your exploitation plan after the project lifetime?	The exploitation plan is mainly towards reusing the expertise and assets to enable DFKI to engage in further research projects or gain industry contracts. No commercial exploitation is planned.

What key outcomes/SW components do you see as having more value for	

creating impact routes for the consortium besides the ASCAPE platform?	
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	The integration, maintenance and further development of the ASCAPE platform as well as consulting for further healthcare providers that are interested in connecting to the ASCAPE platform.
What academic (education or research) opportunities do you see for the consortium in general?	ASCAPE can stand as a prototype of to unify the data sciences in the medical fields while respecting the patients privacy.
What opportunities do you identify for the Open Source Approach?	Open-Source software builds more trust to the users and potential customers, as it provides transparency. Customers can evaluate themself if the software is adaptable to their IT infrastructure.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	Opportunities could be to make the ASCAPE framework open source and to create a body governing and ensuring the central ASCAPE cloud and the federation of installed ASCAPE edge nodes at healthcare institutions. That body should also oversee changes in a deployment version of the ASCAPE platform to ensure its quality. DFKI could be part of that central governing body.
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	If some financing concept could be found, that would allow to remunerate DFKI's work in this body, as DFKI has no basic funding and all its activities need to be funded by third-party funding or industry contracts.

6.11.4 NKUA individual exploitation plans and sustainability expectations

Clinical partners are mainly focused on healthcare delivery, still some developments within ASCAPE involves their IT staff.

Table 30 NKUA Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	NKUA-Sismanogleio, Orebro, Hospital Clinic provide ASCAPE project with expertise regarding cancer and appropriate type of data collection, along with anonymized patient data to help in the training of ASCAPE platform. ASCAPE staff in clinical sites will also help in platform validation. The technologies that we used were: c#, javascript. Regarding the frameworks we used:dotnet core, blazor And SignalR. Regarding the database we used MariaDB and last but not least regarding the server we used .nginx
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	The assets described below are firstly used and developed during the Ascape project and it will be further used in potential research projects
What are your intentions for the components that you are developing regarding IPR and licensing?	The policy of the Ascape project conforms to the appropriate directives of the European Union such as the CD91/250/EEC on the legal protection of computer programs, the CD 92/100/EEC on rental right and lending right and on certain rights related to copyright in the field of intellectual property, the CD93/98/EEC harmonizing the term of protection of copyright and certain related rights, the directive 96/9/EC on the legal protection of databases, the directive 2001/29/EC on the harmonization of certain aspects of copyright and related rights in the

	information society. The commercial exploitation model implies the paid provision of the project results to the end users, complying with a licensing scheme which will be defined in the Ascape business plan
What has been your individual exploitation roadmap during the project?	n/a
What is your exploitation plan after the project lifetime?	Hopefully our department will be able to use ASCAPE platform as contributors to help tailoring patient management according to their individual needs, free of charge as part of the ASCAPE Consortium. We do not envision commercialization of the project for profit.

What key outcomes/SW components do you see as having more value for creating impact routes for the consortium besides the ASCAPE platform?	The interoperability of all pilot's platform
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	Distribute the platform in several healthcare settings
What academic (education or research) opportunities do you see for the consortium in general?	Set the basis for a platform based on Artificial Intelligence technology, which will be enriched prospectively with more patient data
What opportunities do you identify for the Open Source Approach?	The open-source approach is a decentralized software development model that encourages open collaboration. By using open-source software development we get a peer production, with products such as source code, blueprints, and documentation freely available to the public. The open-source approach is a type of licensing

	agreement will allows users to freely modify a work into the Ascape and integrate the work into a larger project or derive a new work based on the original.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	Distributing of the ASCAPE platform to other healthcare facilities in order to improve patient care and also further training of the model
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	Yes, our organization will serve as data distributor.

6.11.5 CAREACROSS Individual Exploitation Expectations and Interests

Table 31 CAREACROSS exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	Developed knowledge about cancer patient experience. Developed knowledge about overall treatment modalities. Developed and evolved skills and methodology for analysing treatment impact on patients' health status and quality of life, from various sources. Developed knowledge of treatment impact on patients' health status and quality of life. Developed and evolved skills and methodology for evaluating patients' health status and quality of life, across several instruments (validated and/or not).

	Developed and evolved skills and methodology for identifying, analysing and selecting potential interventions for preventing, improving and/or managing patients' health status and quality of life.
	Developed and evolved skills and methodology for normalising across different instruments of evaluating patients' health status and quality of life.
	Developed knowledge of data determinants of quality of life.
	Developed knowledge of digital biomarkers.
	Developed knowledge of wearable devices and relevant data for patients' health status and quality of life.
	Developed and evolved skills and methodology for analysing the user experience of patients with wearable devices.
	Developed and evolved skills and methodology for analysing the user experience of healthcare professionals with clinical dashboards.
	Developed and evolved skills and methodology for identifying data relevant for the determination of health economics

	outcomes and the evaluation of the key parameters that affect their significance. Developed knowledge of the relationship between the aspects and parameters of Artificial Intelligence models, and the corresponding patient and clinician experience, including biases, ethical and other aspects. Developed understanding of Machine Learning and relevant training and simulation methods. Developed knowledge and evolved skills and methodologies for evaluating and validating technology frameworks for healthcare services. Developed knowledge of best practices related to visualising health related information. Developed knowledge and methodologies for documenting clinical trial and validation protocol descriptions. Developed knowledge of ethical approval processes for clinical trial and validation protocols. Developed knowledge of the ethical and legal aspects of technology in healthcare.

	The above were developed and evolved for patients overall, cancer overall, as well as for breast and prostate cancer specifically.
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	Being a healthcare technology SME, these are quite aligned with both our research and commercial strategy of our organisation.
What are your intentions for the components that you are developing regarding IPR and licensing?	No software components have been fully developed yet.
What has been your individual exploitation roadmap during the project?	Have used the project knowledge to apply for other EU calls. Have collaborated with other EU projects sharing project knowledge. Have shared project knowledge, skills and methodologies internally. Have collaborated with SMEs and other companies using project knowledge. Have used project knowledge to connect with the industry. Have received interest for commercial opportunities due to the project knowledge.
What is your exploitation plan after the project lifetime?	Although we are halfway through the project, we envision to go deeper and broader in the assets and knowledge, within the cancer space. Moreover, we envision to leverage the assets and knowledge in order to expand beyond cancer. Furthermore, we expect to evaluate further the specific services rendered through the ASCAPE cloud in order to identify possible commercialisation opportunities.

What key outcomes/SW components do you see as having more value for	The most valuable outcomes include the deep knowledge of data determinants and key

creating impact routes for the consortium besides the ASCAPE platform?	success factors for the assimilation of technology into the care pathways of patients, both in the hospital and beyond it.
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	There are several aspects that can lead to commercial opportunities. However, the underlying knowledge described above is the cornerstone for such evolution. Moreover, we anticipate many tangential/orthogonal opportunities to emerge from partners' involvement in the healthcare industry (e.g. with patient groups, policy makers, and more).
What academic (education or research) opportunities do you see for the consortium in general?	Interdisciplinary education can benefit substantially from the consortium's actions. Moreover, research activities can be derived from several knowledge assets.
What opportunities do you identify for the Open Source Approach?	The Open-Source approach may facilitate open learning in the education and non-profit space, as well as validation of third-party components against a well-established framework.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	The core asset towards sustainability of the consortium as a whole is for the facilitation of validation of new components and datasets, similar to an "App Store" approach, specifically for cancer. CareAcross can act as the coordinator of these activities across the patient and clinical realm.
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	Yes, as a coordinator of sustainability activities with third parties.

6.11.6 ALBV Individual Exploitation Expectations and Interests

Arthur's Legal (ALBV) exploitation expectations and interests pertinent to ASCAPE are still under research; they will be concretised at later project stage. The table below provides for provisional input -potentially- subject to updates during the second half of the project duration.

Table 32 ALBV Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	Arthur's Legal (ALBV) provides all the necessary support linked to the legal and ethical aspects of ASCAPE framework. ALBV leads the corresponding task T5.4. ALBV, also, contributed to WP7 on Ethics Requirements. ALBV, therefore, contributes to the knowledge, resulting from ASCAPE research project as a whole.
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	Arthur's Legal is extensively involved in EU funded research involving the development of Artificial Intelligence, in close collaboration with partners across European Economic Area (EEA), ranging from academic institutions to municipalities and industry players of all sizes. Arthur's Legal is, also, largely involved in EU policy making activities taking place, both at national level (e.g. Netherlands) and EU level. Taking into account ASCAPE's scope and Arthur's Legal profile, the knowledge to be acquired throughout the project duration will add to Arthur's Legal existing expertise and capacity to: i) best guide the broader AI community of stakeholders (e.g., regulators, policy making bodies, companies) through the related legal and ethical implications of AI -primarily- concerning privacy and security. ii) efficiently support the deployment of security and privacy by design AI solutions linked to the project's scope. Note that the duration of Arthur's Legal involvement in ASCAPE (M1-M36) allows the firm to monitor the different progress stages of the technical work and gain knowledge, also, by addressing "real time" questions that affect technical decisions. Overall, ASCAPE will offer Arthur's Legal new opportunities to grow by cross-fertilizing

	the technical knowledge, especially, relevant for security and privacy aspects of AI.
What are your intentions for the components that you are developing regarding IPR and licensing?	N/A
What has been your individual exploitation roadmap during the project?	The approach so far taken by Arthur's Legal regarding the related exploitation plans during Year 1 and Year 2 of ASCAPE can be summarised, as follows: Year 1: The knowledge resulting from ASCAPE has been taken into account , when applying for other EU calls. Year 2: The knowledge resulting from ASCAPE has been taken into account , when applying for other EU calls; it will, also, be further taken into account for other applications for EU funding, during the remaining part of Year 2. Overall, the knowledge acquired so far by the project has been taken into account, also, in the context of the regular services offered by Arthur's Legal to its international clientele. (See, also, above the relevant discussion on knowledge exploitation.)
What is your exploitation plan after the project lifetime?	The approach undertaken during Year 1 and Year 2 of the ASCAPE project will be, also, pursued after the end of the project. It is important to stress, though, that Arthur's Legal aims to exploit the knowledge acquired in a wider context, meaning, with respect to quality of life as a whole, going beyond the fields of "care" and "cure" a such and, therefore, exploring related opportunities beyond the domain of health.

As mentioned above with respect to exploitation expectations and interests pertinent to ASCAPE, Arthur's Legal (ALBV) Sustainability expectations are still under research; they will be concretised at later project stage. The table below provides for provisional input -potentially- subject to updates during the second half of the project duration.

What key outcomes/SW components do you see as having more value for creating impact routes for the consortium besides the ASCAPE platform?	To be determined at a later project stage.
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	To be determined at a later project stage.
What academic (education or research) opportunities do you see for the consortium in general?	To be determined at a later project stage.
What opportunities do you identify for the Open Source Approach?	The Open Source approach may link to several opportunities, such as facilitate scaling and consolidating for organizations using ASCAPE Platform and prevent the risk of vendor-lock in.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	To be determined at a later project stage.
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	Arthur's Legal is interested in joining a possible Sustainability Body for ASCAPE Platform. Given the existing experience and knowledge, Arthur's Legal could have a role within the respective governance mechanisms (e.g. member of the Board).

6.11.7 INTRA Individual exploitation, sustainability expectations and Interests

Table 33 INTRA Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	INTRA has led the creation of the overall architecture of the ASCAPE platform. Moreover, INTRA has played a key role in the requirements gathering process and the overall design of the pilot studies in close collaboration with both the clinical and the legal experts in the Consortium. The main software asset INTRA contributes is the ASCAPE Visualization Library and the ASCAPE Dashboard which is based on it. Additionally, INTRA contributes two Edge components that play a key role in the data ingestion of weather data, wearable data, and patient data from the Healthcare Provider's Information Systems, and is responsible for the deployment of Edge nodes at pilot sites.
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	INTRA has a significant commercial presence in the healthcare sector, as well as a significant presence in health-related eU research projects. Ultimately, the aim is to have the research project participation such as ASCAPE lead into next-generation healthcare IT systems utilising Big Data and advanced AI to maintain and enlarge INTRA's share in the global healthcare IT sector. In the commercial context, INTRA sees the ASCAPE Platform as a platform that can enhance existing information systems in the healthcare sector, a direction it has helped steer the project in as the leader of the architecture task.
What are your intentions for the components that you are developing regarding IPR and licensing?	INTRA will release the ASCAPE Visualisation Library and the ASCAPE Dashboard under an open-source license. Additionally, INTRA, in collaboration with partners contributing to ASCAPE Edge and Cloud components, have reached an agreement to release all relevant ASCAPE Edge and Cloud software under open-source licenses with the sole exception of the specific Homomorphic Encryption

	technology used in ASCAPE and the related Homomorphic Encryption Learning functionality which is based on proprietary background IP. On the basis of this agreement, it will be possible for a fully operational open-source distribution of the ASCAPE Platform to be released, in addition to any premium added-value distributions that may be produced as an additional commercial exploitation route.
What has been your individual exploitation roadmap during the project?	To this point, INTRA's efforts have been in the direction of ensuring there will be a secure, straightforward exploitation strategy on the basis of (a) open-source licensing (b) an architecture that facilitates using ASCAPE outcomes in order to enhance existing healthcare IT solutions. Both those aims have been achieved. At the same time good working relations have been established with all participating partners thus laying the foundation, not only for independent but also for collaborative exploitation. Much of this groundwork was laid in the first year of the project and specifically in the course of WP1 and Task 1.3 both of which were lead by INTRA. Internally, INTRA has taken the necessary steps to ensure there is internal awareness of the project, its progress, and its outcomes, so that both research and commercial opportunities are identified. These efforts will intensify in the coming months, as the project has now reached an important milestone with the completion of a demonstrable prototype of the ASCAPE Dashboard which will serve as a concrete basis for explaining the project's value, both internally and to external parties. The Open Call is another opportunity in the DoA for potential collaboration both with healthcare providers (potential customers) and with SMEs or research institutions

	(potential collaborators) and INTRA is actively supporting the relevant efforts.
What is your exploitation plan after the project lifetime?	There is a clear exploitation plan for further research on the basis of INTRA's involvement in the architecture, requirements gathering, visualizations and UI design UI for doctors, and its core competencies in these areas. INTRA is also optimistic that commercial opportunities may exist, either on the area the project focuses or on other medical applications where privacy matters, but machine learning techniques require Big Data data from a large number of healthcare providers. There may even be scope for applying the same privacy-preserving techniques in non-medical applications.
What key outcomes/SW components do you see as having more value for creating impact routes for the consortium besides the ASCAPE platform?	In INTRA's view, the optimal impact route for the Consortium would be to focus on the ASCAPE Platform as a whole. There are technologies and know-how that can be re-used and enhanced in other research projects, but the ASCAPE Platform itself as a whole is the prime candidate for commercial exploitation.
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	The ASCAPE Platform is *en route* to fulfilling the relevant stated aims of the project. By M34 the project will have been successfully demonstrated to be able to offer AI support to doctors caring for breast cancer and prostate cancer patients dealing with QoL issues related to their cancer type and its treatment. Moreover the ASCAPE Platform will have been successful in offering IT infrastructure for coordinating the collection of patient data from a number of pilot sites each using different means of interacting with their patients. Ample research opportunities will exist even before that point. Individual partners can provide services and build or enhance products on the basis of the ASCAPE Platform, either in its

	entirety or its open-source subset. However, the ideal exploitation path would also include the operation and maintenance of a single ASCAPE Cloud, as originally envisaged, rather than a fragmentation into a number different commercial and/or research clouds. While the unified ASCAPE Cloud will have a cost to maintain, it may also be a valuable asset in its own right. Likewise, the ASCAPE models at the end of the project will also be a valuable asset. The ASCAPE business plan will need to balance commercialisation and infrastructure sustainability needs with the aim of low barriers to the use of both the Cloud and of the ASCAPE models.
What academic (education or research) opportunities do you see for the consortium in general?	ASCAPE explores techniques of privacy preserving machine learning and explainability, as well as a novel application in the health domain (QoL of prostate and breast cancer). A lot of interesting research has unfolded already, and more is underway. Both the AI-methods focused, and the applications focused direction look particularly promising for building up on the expected ASCAPE outcomes.
What opportunities do you identify for the Open Source Approach?	Given that a fully functional open source distribution of the ASCAPE Edge and Cloud can be created due to the licensing of the relevant components, it is legally uncomplicated to provide services and build products on the basis of ASCAPE technology. The means to realise the ASCAPE vision is to enhance existing systems rather than attempt to replace them. Thus service provision can be a straightforward commercial opportunity for ASCAPE partners. Product enhancement is another commercial opportunity. At the same time, the openness of the AI code may also led to independent improvements and opportunities for research collaboration. To some degree, this may be possible even in the limited time-frame of the Open Call.

What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	The open-source decision is a solid foundation for the sustainability of ASCAPE, but it should not be assumed that it will guarantee sustainability. It seems prudent to foresee a body for managing the development direction of the ASCAPE Platform, starting with an initial agreement between partners which may emerge into a non-profit organization. At the same time, partners will need to maximize their individual/group efforts for exploitation (be it commercial or research, depending on the nature of the partner's interests), in order to provide internal justification for further investment in the development of the ASCAPE Platform and individual outcomes. It is relatively early at this stage to have a clear understanding of the dynamics that will play a role in the sustainability of ASCAPE, but the foundations have been laid. INTRA has been active in this process and is prepared to explore commercial and research opportunities and support ASCAPE's long-term sustainability.
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	INTRA would be interested in joining a Sustainability Body for the ASCAPE Platform and contributing towards both technical and business decision-making in line with its role in the project and its commercial presence in the health IT sector.

6.11.8 UNSPMF Individual exploitation, sustainability expectations and Interests

Table 34 UNSPMF Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	• Edge AI Models Manager • Cloud Federated Learning Coordinator • ASCAPE AI Knowledge Manager • Edge AI Predictions and Simulations Manager
Why are you interested in those assets? Is it aligned with the research or	UNSPMF will use the involvement in the ASCAPE project to improve the knowledge

commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	of its employees and increase their capacities to contribute to the European projects in which they participate and those to which they will participate.
What are your intentions for the components that you are developing regarding IPR and licensing?	The IPR management will play a major role in deciding whether a particular outcome of the project should be disseminated, exploited or both. In other words, UNSPMF will deal with intellectual property rights (IPR) issues, taking into account the EU policies and including fostering the transfer of technology.
What has been your individual exploitation roadmap during the project?	The exploitation activities will be focused on several different target groups with distinct interests and needs: • Academia and education- Universities and research centers will be approached through scientific journals and conferences, workshops, special sessions, dealing with AI and healthcare. Additionally, the UNSPMF team will incorporate material and research results of the project into the University courses related to the topic of the project. This will enhance the course curriculum with new research and with the current state of the art. This approach can support building and engaging a community of future engineers around ASCAPE solutions and secure its exploitation. • Healthcare system - The Healthcare system is represented by those organizations and actors representing the target sector of the ASCAPE solution. This segment of project results exploitation will be aligned with the Market analysis activities and agreed with other project partners. Also, together with

	project partners, UNSPMF will perform a demonstration for interested Healthcare stakeholders by organizing INFO days. • Policymakers - Project exploitation in this segment will be strictly connected with creating an ecosystem supported by the existing networks for integrating research results into the existing standards landscape and establishing new areas of standards. • Innovation communities - Hubs, clusters, and other competence centres that contribute to building innovation paths that are able to promote the socio-economic growth will be approached nationally and regionally through public events organized by them, us, or other stakeholders. We will take targeted actions together with the innovation communities using their position in the society related to innovation capacity building and potential impact in relevant target groups, especially investors, to maximize exploitation potential.
What is your exploitation plan after the project lifetime?	We are going to expand our aims to deliver and transfer knowledge regarding technological advancements to the academic community and built new collaborations and partnerships in the research and health domain of Europe.
What key outcomes/SW components do you see as having more value for creating impact routes for the consortium besides the ASCAPE platform?	All research results and clinical validation that is being done will be published and be openly available once complete. As such this

	will be a valuable addition to the competitive advantage of the ASCAPE solution.
What commercial opportunities do you identify for ASCAPE Platform for the consortium in general?	To establish a community
What academic (education or research) opportunities do you see for the consortium in general?	UNSPMF focuses on establishing connections with target groups and defining future collaboration.
What opportunities do you identify for the Open Source Approach?	The ASCAPE project is using some open-source elements during software development however there are different open-source models. If it is open source without restrictions then the open-sourced module can be used freely as this is a permissive model and does not make demands on our IPR. For the purpose of joint exploitation of the integrated system, there should be an agreement on IP of the integrated system.
What opportunities do you identify for the sustainability of ASCAPE Platform? What role do you envision for your organization within those opportunities?	EU initiative and Sustainability Body
Would you be interested in joining a possible Sustainability Body for ASCAPE Platform? What role do you envision for your organization within this SB?	Yes

6.11.9 FORTH Individual Exploitation Expectations and Interests

Table 35 FORTH Exploitation plan

Exploitable assets and results. Does your organization develop some of the project results? If you don't develop any of the assets of the project, explain your participation in ASCAPE project	FORTH contributes to ASCAPE bringing in its extensive experience in the areas of security contributing to the security, privacy and trustworthy toolkit of ASCAPE providing a development edge node including security enhancing technologies like SGX and data computation enhancement through the use of GPU acceleration in the analysis of the produced data. The whole infrastructure

	provided to the consortium is based on the technologies provided through secure, independent docker containers
Why are you interested in those assets? Is it aligned with the research or commercial strategy of your organization? If you don't develop any of the assets of the project, explain what your interests are in exploiting the knowledge acquired during the project.	The assets and infrastructure created for use in ASCAPE is aligned with the R&D activities f our team and can be beneficial to all the ML researchers of our institution. Its decentralized character allows its exploitation by other projects either internal or external.
What are your intentions for the components that you are developing regarding IPR and licensing?	As FORTH is a research institute that usually relies on the Open Source community we don't foresee to generate, or hold any specific IPR from the developed technologies. The infrastructure though could be leased and support could be provided in a contract-based manner.
What has been your individual exploitation roadmap during the project?	All knowledge, tools infrastructure developed are internally shared to our team exploring how it can be used in the current research activities and open problems that our team works on. Through ASCAPE we are meeting with major stakeholders of health and AI industry and could be exploited in the future for new research proposals.
What is your exploitation plan after the project lifetime?	FORTH during and after the end of the project wants to promote the commercial exploitation of R&D results by providing services, licensing specific products to industrial partners, contracting with industrial partners to jointly develop new products, and participating in start-up/spin-off companies and joint ventures. FORTH plans to exploit the innovative project results by publishing the research achievements and innovations obtained within the project to the scientific community through peer-reviewed publications in high-quality journals and international conferences. Also new research opportunities will arise from the

	successful completion of ASCAPE. Finally, FORTH aims to offer high-quality knowledge to enhance research on domain areas to the project for the BSc, MSc, and Ph.D. students and deliver highly qualified scientists with a background in advanced ICT technologies to the industry.

7 IPR management

The IPR management is key for exploitation of ASCAPE as we propose new technologies, AI engines, interoperability mechanism, encryption, and new methods for fulfilling QoL needs associated to breast and cancer survivors. Some of those methodologies will be results of collaborative work. Therefore, it is necessary to find an agreement for the protection for the results as well to clearly define the participation in the joint ownerships. The partners are aware IPR related choices have an impact in the commercialization of the outcomes of the project as well in the business models. Therefore, decisions related to the protection of intellectual rights could facilitate the obtention of additional funds for commercialization. IPR are also key to achieve fair agreement among the partners. The IPR protection strategy is regulated by the Grant Agreement (GA) and the Consortium Agreement (CA) of the project.

7.1.1 Ownership of the results

The output of ASCAPE is the result of extensive collaborative work. The partners are cooperating and therefore is necessary to reach an agreement on how to protect their intellectual property. The IPR inventory provides details of the different assets as well the IPRs. The final version of the inventory will provide the basis for establishing the ownership of the results as well how the exploitation of the assets will be performed.

7.2 Intellectual property registry

In a complex, multidisciplinary and international project is key to define clearly the activities performed by all the partners and their involvement in the development of the results of the project. As the ASCAPE platform evolves and reaches the status for being commercialized, the current living IPR inventory document would be updated accordingly, after the end of the project with a greater level of TRL the IPR will not change significatively. The IPR inventory provides a common understanding among the consortium related to the IPR ownerships, potential commercialization constraints of the identified assets.

This inventory defines in a clear way the participation of every partner in the different outcomes of the project and helps the consortium in managing the different assets and results as well identifying potential constraints. As the ASCAPE platform is close to a full commercial system, it is expected that the current living IPR inventory document will not vary substantially in the next coming years.

Last Updated	Component	Main Technology	Short Description	TRL initial (January 2020)	TRL before pilots (June 2021)	TRL final - After Pilots (December 2022)	Dependencies with other subcomponents	Subcomponents	Subcomponent Owner	License	URL of the kind of license	Subcomponent License Conflict ?	Foreseen interfaces with other components	Copyright holder	Expected Component License	URL (link to the lincense text)	Comments
4/13/2021	Health Suite	HLT7 FHIR REST API	Interoperability layer based HL7 standard	TRL 7 Prototype near or at planned operational system. Represents a major step up from	TRL 8 Technology system in its final form	TRL 9 Technology system in its final form and in full commercial deployment	HIS and Redactable data management	Terminology Server	Atos	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	None	API REST	ATOS	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	
		WSO2 REST APIS	Authentication, Authorisation Manager	TRL7	TRL8	TRL8	All components		STS	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	None	API REST	STS	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	
6/4/2021	ASCAPE Visualisation Library	Web Front-End Library (Javascript/CSS)	A visualisation library enabling integration of Hospital Information Systems with ASCAPE	TRL 2	TRL 4	TRL8	Edge Node (primarily Simulations and Predictions Manager)	eCharts, dygraphs, jQuery, bootstrap	Atos third parti	Various open source licenses		None	API REST	INTRA	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	
6/4/2021	ASCAPE Dashboard	ASP.NET 5.0 Web Application (Front-End/Back-End)	A stand-alone tool enabling Doctors to benefit from ASCAPE AI	TRL2	TRL4	TRL8	Edge Node (primarily Simulations and Predictions Manager, but also Device Data Synchroniser)	ASCAPE Visualisation Library	INTRA	Various open source licenses		None	API REST	INTRA	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	
6/4/2021	Data Enricher	ASP.NET 5.0 REST API Service	A service enriching data sent by the HIS on its way to the Redacted Patient Data Manager; the enrichment involves external data sources for which ASCAPE adapters are available	TRL2	TRL4	TRL8	Open Data Adapter					None	API REST		Apache licence 2		
6/4/2021	Device Data Synchroniser	ASP.NET 5.0 REST API Service	A service enabling the collection and transmission to the Redacted Patient Data Manager of patient devices; the collection involves external data sources for the devices for which ASCAPE adapters are available	TRL2	TRL4	TRL8	FitBit Data Adater					None	API REST		Apache licence 2		
6/29/2021	Explainable AI	scikit-learn	Explainable AI components provide explanations about AI models and their predictions.	TRL2	TRL3-4	TRL7	AI edge and cloud components	Feature Attribution, Global/Local Surrogate Model Manager	scikit-learn (	BSD License	http://www.gnu.org/licenses/license-list.html#OriginalBSD	None	API REST	DFKI	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	
6/29/2021	Simulations	scikit-learn	Library that allows to determine and rank intervention effects on QOL issues based on available local and global models to predict QOL issues	TRL2	TRL4	TRL7	Edge components (Redacted Patient Data Manager, Models Manager, AI Predictions and Simulations Manager)		scikit-learn (	BSD License	http://www.gnu.org/licenses/license-list.html#OriginalBSD	None	API REST	DFKI	Apache licence 2	https://www.apache.org/licenses/LICENSE-2.0	

Figure 18 Screenshot of the IPR inventory of the project

7.3 Protection and use of the results

The other general purpose of the IPRs activities is guiding the consortium in their decisions over which IPR protection, such as copyright, patenting or releasing code under open-source software licenses can be better used for both defending the innovation IPR and for paving the way to commercialize the ASCAPE project assets. IPR protection is usually classified under two types. On one hand the so-called neighbouring rights that are those close to copyright © on the other hand the industrial IPR and those related to Open Sources initiatives. Neighbouring rights and copyrights aim at protecting the creating effort of the author of new music, literature, videos, etc. and This protection allows authors to control their distribution and exploitation. ASCAPE educational material, videos, brochures, presentations papers and so on, are subject to be copyrighted. This form of protection provides minimum of protection which should be enough for educational material. Patents can protect novel products as the ASCAPE sensor. It always needs to be considered how widespread this protection needs to be as the costs between national and European or international patents can differ considerably. Software protection is however a little bit complex, especially if developments are based on existing code. Constraints and obligations imposed by using already developed open-source piece of code must be seriously considered for planning the business models, and overall, for how the non-guarantee open source statements could impact consortium liability. The figure below provides a general IPR overview.

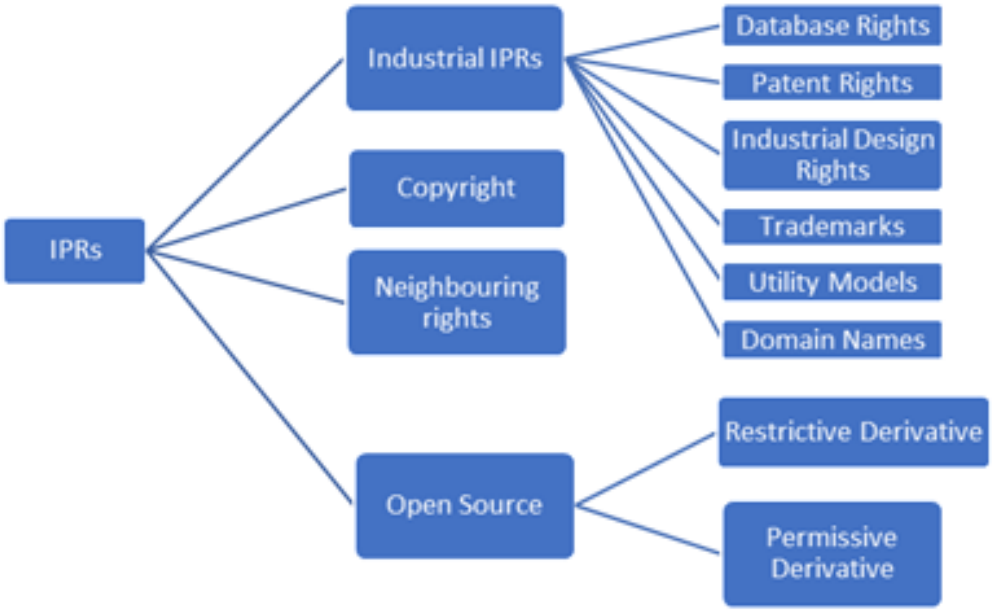


Figure 19 IPR scheme of different protection and licences based.

7.4 Revision of Open Sources Licenses

In this section a brief revie of the most common OS licenses is provided here[7]. This information is included for clarification purposes related to the IPR inventory and the licensing model for the work to be done in ASCAPE. The licenses provide a different mechanism to regulate the distribution, improvements of new versions the rights generated by the owners and the derivative works.

According to how derivative works are considered, two major trends in the different Open-Source licenses:

- **Restrict derivative works licensing:** These licenses impose that derivative works are distributed maintaining the freedom of the initial work. Examples: GPL, Copyleft,
- **Permissive derivative works licensing:** These licenses do not impose restrictions on terms and conditions regulating derivative works, which can be even commercial. Examples: Apache License, BSD.

The most common licenses are summarised here below:

[7] https://opensource.org/

Table 36 List of most common licenses used

Name	More info	Description
Eclipse Public License (EPL-2.0).	https://www.eclipse.org/legal/epl-2.0/	The EPL aims at being business-friendly free software license and features weaker copyleft provisions than contemporary licenses such as the GNU General Public License (GPL). The granted of EPL-licensed programs is allowed to modify, copy and distribute the work but might be obligated to release their own changes in some cases
Academic Free License (AFL)	https://opensource.org/licenses/AFL-3.0	The AFL gives you copyright if you include the original source code, a statement saying you modified it, and any trademarks or copyrights associated with the original.
Adaptive Public License	https://opensource.org/licenses	An adaptable copyleft license template that users can modify to suit their needs
Apache Software License	https://www.apache.org/licenses/LICENSE-1.0	Obsolete License. Used from 1995 to 1999. This license is only applicable with earlier versions of Apache Software.
Artistic license	http://www.perlfoundation.org/artistic_license_2_0	AL intends to give the copyright holder control over the development of a software "Package" while keeping it open-source and free
CCO	https://creativecommons.org/publicdomain/zero/1.0/	This is basically a no copyright license. Software under a CCO is under public domain
Common Development and Distribution License	https://en.wikipedia.org/wiki/Common_Development_and_Distribution_License	This is a very popular free software license in use a free and open-source license based on the Mozilla Public License.
EU DataGrid Software License	http://ec.europa.eu/idabc/en/document/7774.html	A free open-source software license created by the European Commission. It's used for software distribution

Name	More info	Description
Lucent Public License	https://opensource.org/licenses/LPL-1.02	LPL was originally written for nix created by Bell-Labs.
MIT license (MIT).	https://opensource.org/licenses/MIT	Like BSD, with most rights to the user that can use the software into larger systems, either Open Source or commercial. A simple permissive software license used by the Massachusetts Institute of Technology (MIT) many times over. It allows you to do just about anything you want with the software. There are many descendants of this license.
OpenContent License	http://www.ibiblio.org/foswiki/bin/view/Main/OpenContentLicense	License created by the OpenContent (OC) movement. Under this license distributed work is allow as well modified works under the conditions of reference what work was changed and the exact nature of the change.
Open Software License:	https://opensource.org	A copyleft license that requires that you disclose the original source code with any copies shared.
PHP License	http://php.net/license/3_01.txt	PHP, the popular web-programming language, is distributed under this license
Python License (CNRI Python License)	https://www.python.org/download/releases/3.3.0/license/	Based on the the Python license that addresses its affiliation with the Corporation for National Research Initiatives (CNRI). It is a tolerant license for modifying software
RealNetworks Public Source License	https://opensource.org/licenses/RPSL-1.0	RealNetworks reserves the rights to use any software modifications.
Reciprocal Public License	https://opensource.org/licenses/RPL-1.5	Based on GPL license, the Reciprocal Public License is a copyleft license for open and free software
Ricoh Source Code Public License:	https://opensource.org/licenses/RSCPL	RSCLP grants high level of protection to the authors

Name	More info	Description
Ruby License	http://www.ruby-lang.org/en/LICENSE.txt	Specific licence for redistributing and modifying Ruby based software.
Sun Public License	https://opensource.org/licenses/SPL-1.0	It is based in the Mozilla Public License8, the Sun Public License is approved as a free software license by the FSF9.
Vovida Software License	https://kb.acronis.com/sites/default/files/content/2011/08/24244/vovida.txt	A simple license for people to freely distribute software.
W3C License:	https://opensource.org/licenses/W3C	A World Wide Web Consortium licence10 aims at providing a intellectual property disclaimer to protect the owner.

7.5 Legal framework

The legal framework is fully addressed by the ASCAPE consortium within Task 5.4 Legal framework, monitoring and ethical aspects. In this section, we just provide a summary of some important aspects that are considered within the scope of Task 5.4. Overall, is necessary to highlight the importance of designing a secure and private system that complies with General Data Protection Regulation (GDRP), as the project deals with personal data. In addition, the GDPR National and regulations must also be considered, especially for commercialization purposes derivate of the European Single Market (ESM).

Therefore, Task 5.4 the work done during the first period of the project by considering the legal framework related to the implementation of ASCAPE in the different clinical sites and in Europe.

[8] https://www.mozilla.org/en-US/MPL/
[9] http://www.fsf.org/
[10] https://www.w3.org/

8 Standardisation

8.1 Standardization approach and objectives

Standardization is an important aspect for the ASCAPE project. Standardization activities of ASCAPE are focused both on the adoption of already defined standards in healthcare, as well as follow up of those standards and if possible, contribute to their improvement. This is of great importance since standardization offers a systematic and organised approach for successful project accomplishment, and provides a common terminology based on the consensus of different stakeholders.

Healthcare systems evolve slowly because they deal with critical activities; they take care of the quality of life of people. Even though there is a huge advance in semantic and cross-border interoperability, hospitals continue to be reluctant to change their systems and adopt these advances mainly because of the collateral effects produced. The usual architecture in these organizations comprises multiple subsystems connected through ad-hoc integration engines. ASCAPE aims at creating: 1. An infrastructure for the provision of semantic interoperability of health data complying with privacy, security, and health standards at the European level. 2. Offer services for the storage and management of homogenized clinical data and metadata allowing the continuum of care without borders, as well as for accuracy, retrieval, analytics and traceability in multicentre studies. 3. Implementation Artificial Intelligence) models based on the latest generation of eHealth EHR standards (HL7).

8.2 Standardization groups

Nowadays several international organizations are in the process of defining standards for Electronic Health Record. Health Level 7. HL7 is an international standardization organization that has defined the Clinical Document Architecture (CDA) standard to model clinical documents. HL7. The standardization body is also developing HL7 Fast Healthcare Interoperability Resources (FHIR). This standard defines an easy to implement, and rigorous mechanism for exchanging data between healthcare applications through REST web services. The technical committee 251 of the European Committee for Standardization (CEN) has developed a European Standard, now accepted as an ISO standard, for the communication of the electronic health record called CEN/ISO 13606. The openEHR consortium has also developed the specifications of a complete architecture designed to support the development of distributed, patient-centred, life-long, shared care health records. The expansion of our knowledge of medicine has been accompanied by an evolution in controlled medical terminologies and vocabularies. The evolution towards a common use of clinical terms and associated term codes has the potential to enhance the quality of clinical documentation and the communication of health information. Many clinical information management tasks rely on consistent use of terminology, such as clinical

data capture and presentation, information integration, indexing and retrieval, and communications between information systems. The agreed use of terminologies can ultimately lead to semantic interoperability, where there is sufficient common understanding about the information that is exchanged to allow some degree of processing to be performed by an automated process in the receiving system rather than by a health professional. Some terminological resources are designed to serve specific purposes in a specific medical field. For example, Logical Observation Identifier Names and Codes (LOINC) is designed for laboratory result encoding, whereas other general-purpose terminologies such as SNOMED CT are used to univocally point clinical meaning of data. ASCAPE can reuse some existing solutions and technologies providing terminology services like: SNOMED CT constraint language evaluation engine. SNQuery is an engine for the evaluation and execution of the SNOMED CT constraint language defined by SNOMED CT International. SNQuery allows specifying expressions that, once executed, return a subset of concepts that meet the expressed constraints.

9 Conclusions

D5.2 presented the communication, dissemination, exploitation and standardization plans, and activities devised and materialised by the ASCAPE partners.

For the communication and dissemination part, we showcased all activities related to the different kinds of channels and tools we used to make sure that the ASCAPE results will have a real impact and be visible to end-users (clinicians, cancer patients) and to audiences that can assist to the further development and introduction of the suggested solutions to clinical practice. As was documented in section 6 of this report, during this first period of the project the consortium was active both in quantitative and qualitative terms by disseminating outcomes of the project at scientific conferences/workshops and industry events, organising events and by making a significant effort to strengthen its presence to multiple communication channels.

At the exploitation and market analysis part of this deliverable, it was indicated that hospitals, industry, research centres, healthcare authorities have invested large amounts of funds on early diagnosis, personalized treatment, but still, there is a bottle neck in translating new discoveries, mathematical models into clinical workflows and culture to provide personalized care. Therefore, there is room for ASCAPE to enter the respective market since by design it takes into consideration multiple parameters like the health economics models, the medical evidence of proposed AI services, and changes in stakeholders' mindsets regarding AI-base care adoption. Furthermore, in the short term, ASCAPE has the ability to boost QoL research based on AI models but also to increase and facilitate data exchange by adopting well-established standards.

Other issues have been also taken into account like interoperability, standards, IPR management, regulations and reimbursements that will contribute to the successful implementation of the ASCAPE AI-based service implementation in real clinical settings.

The updates on all related activities will be reported in D5.4 "Final business model, long-term sustainability and stakeholder engagement report", due in December 2022. D5.4 will provide further understandings related to the full business potential of the ASCAPE platform based on real outcomes to be got from the pilots. That deliverable will also provide the roadmap for commercialization and the expected revenue model based on the health economics analysis. From the proposed business models, we expect that they will be also savings because of AI-proposed models for QoL interventions. On the other hand, we are aware of the difficulties in accurately estimating the full economic impact and intangible benefits but nevertheless are foreseen to be of a considerably monetary and social value.

10 References

1. https://www.coursehero.com/file/36832297/discussion-1docx/. (s.f.).
2. Marketwatch. (2021). https://www.marketwatch.com/press-release/healthcare-it-hit-market-2021-study-by-business-opportunities-top-manufacturers-records-production-revenue-growth-rate-price-and-gross-marginwith-top-growth-companies-2021-05-21.
3. Mckinsey. (s.f.). https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-essentials-of-healthcare-innovation.
4. Nyatanga, B. (2020). COVID-19 pandemic: changing the way we live and die. Br J Community Nurs.
5. Perez Manuel, e. a. (2020). D1.4. Manuscript on costs and benefits of the new diagnostic tool. ASCAPE.
6. https://www.euro.who.int/en/health-topics/noncommunicable-diseases/cancer
7. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12154-Europe-s-Beating-Cancer-Plan
8. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12154-Europe-s-Beating-Cancer-Plan