Grant agreement no. 675451

CompBioMed

Research and Innovation Action
H2020-EINFRA-2015-1
Topic: Centres of Excellence for Computing Applications

D4.1 Innovation Plan

Work Package: 4

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Contributors: All WP4 beneficiaries

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CO	Confidential, only for members of the consortium (including the Commission Services)	
CI	Classified, as referred to in Commission Decision 2001/844/EC	

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1 Version Log

Version	Date	Released by	Nature of Change
V1.1	27/01/2017	Paul Best	Draft 1
V1.2	05/03/2017	Paul Best	Draft for Editorial Revue
V1.3	16/03/2017	Paul Best	Formal Issue

2 Contributors

Name	Institution	Role
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3 Acronyms and Definitions

Acronyms	Definitions
CoE	Centre of Excellence
IC	Intellectual Capital
IP	Intellectual Property
IPR	Intellectual Property Rights
WP	Work Package
KPI	Key Performance Indicator
IAB	Innovation Advisory Board
HPC	High Performance Computing
HTC	High Throughput Computing
SME	Small and Medium Enterprise
EsD	Exascale Demonstrator
cPPP	contractual Public Private Partnership

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4 Executive Summary

This document is the Centre of Excellence for Computational Biomedicine (CompBioMed) Innovation Plan, designed to promote interdisciplinary entrepreneurial opportunities among software vendors (by determining licencing approaches), hardware vendors (by helping hardware providers innovate to define the road to the exascale) medical device manufacturers and pharmaceutical companies (by providing access to simulation techniques) and the wider healthcare sector including hospitals and their substantial computational challenges.

This document is the top-level plan, to be adhered to by all members of the consortium in executing Innovation Management activities within the project.

5 Introduction

Computational methods, based on human biology and physiology, are now reaching maturity in the biomedical domain. These methods are rendering predictive models of health and disease increasingly relevant to clinical practice by providing a personalized aspect to treatment, and supporting the reduction of animal and human experimentation. Computer based modeling and simulation is well established in the physical sciences and engineering, where the use of both high performance computing (HPC) and high throughput computing (HTC) is now routine. CompBioMed is a user-driven Centre of Excellence (CoE) in Computational Biomedicine, designed to nurture and promote the uptake and exploitation of HPC and HTC within the biomedical modelling community. Our user communities come from academia, industry and clinical practice.

The CompBioMed CoE in Computational Biomedicine is distributed in nature, relying on collaboration between the core project partners, the associate partners and also with external stakeholders. To this end, CompBioMed will develop and coordinate Innovation Management activities that enable us to engage external stakeholders in academia, healthcare and industry with the activities of the project. The success of CompBioMed relies on its results being disseminated into and used by the biomedical community, as well as growing and interacting with its user communities.

The success of CompBioMed also relies on its ability to monitor the wider computational biomedical landscape to locate disruptive technologies which will influence the research within CompBioMed and hence its ability to serve as a CoE for the biomedical community.

There is substantial innovation potential for our CoE, in part due to the extensive number of private companies participating in the project, both as full and associate partners. We shall seek to realise this potential in several directions, including new opportunities that are now arising in the commercial sector, exploiting HPC and HTC in order to develop new, different, better and faster solutions than have hitherto been possible. Some of these openings will emerge directly through the CoE's business incubation activities and some will come from licencing of software systems and stacks which are installed on these resources, which will influence the approaches to be adopted in future.

The CompBioMed project has successful Innovation as a key thread throughout the high level project objectives, characterised as follows:

- Promotion of user driven, interdisciplinary entrepreneurial opportunities

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- Promotion of innovation in the field of computational biomedical modelling and simulation
- Use of *in silico* models as a source of innovation in pharmaceuticals and medical device applications
- Working in synergy with industrial partner SMEs and HPC providers within our consortium for high-end computing access mechanisms
- Providing HPC partners with better insight into the CompBioMed ecosystem
- Helping industrial users set the direction of our Centre and to benefit from the software tools and techniques developed

A dialogue has been established with the wider contractual Public Private Partnership (cPPP) actors to ensure that:

- The approach to Innovation Management in CompBioMed is aligned with the overall strategic objectives of the cPPP
- Synergistic benefits of co-exploitation with other CoEs and Exascale Demonstrators (EsDs) as they evolve are realised
- Lessons are learned for the establishment of best practice methods for successful innovation across CoEs

This plan establishes mechanisms to actively promote *in silico* methods to the pharmaceutical and medical device industries, and the wider research community. The plan provides guidance for all project participants in implementing Innovation Management activities.

This is deliverable D4.1: Innovation Plan, the output of CompBioMed's Task 4.1: Production of an Innovation Plan and publishing the first issue of the document is Milestone 6 in the project.

It is a 'living' document that will be updated throughout the lifetime of the project, as required.

6 Innovation Management

6.1 Interpretation

There are numerous and varied definitions of Innovation Management used across EU and other projects with research and innovation objectives. In addition, the stakeholders, partners and the wider community have different perspectives on Innovation Management, what it entails and how to achieve success.

To align perspectives and support the approach to be adopted inside the project, Innovation Management within the CompBioMed project will use the definition *"Overall management of all activities related to understanding needs, with the objective of identifying new ideas, and managing them in order to develop new products and services which satisfy these needs".*

These needs encompass the range of research impact, societal impact and commercial impact that may be achieved as a result of the action.

6.2 Implementation

UEDIN coordinates Innovation Management in the project as Work Package 4 lead, supported by task leaders in Innovation Plan Development (CBK), Incubation Coordination (SARA), cPPP

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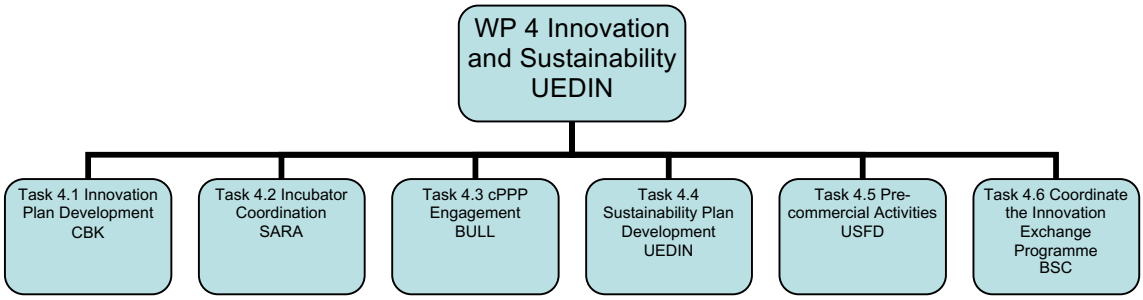
Engagement (BULL), Pre-commercial Activities (USFD) and Coordination of the Innovation Exchange Programme (BSC).



Work Package 4 – Innovation and Sustainability
UEDIN is also leading the task Sustainability Plan Development and during the execution of this task, UEDIN will oversee quality of services, key party relationships and adherence to standards across the project as a whole, and hence innovation activities specifically.

The detailed descriptions of these tasks and the resources assigned to them can be found in the CompBioMed Description of Action, an extract of which appears at Annex A.

7 Innovation Process

Innovation Management activities in the project are designed to promote interdisciplinary entrepreneurial opportunities within the research activities, from invention through to exploitation. For each invention entering the process, the benefits and potential for impact will be assessed, the capacity to exploit from within the project (and/or need for exploitation beyond the project) will be considered and the mechanism for exploitation will be formulated, whether for research, societal or commercial impacts. This process will be applied to the anticipated products and services generated from the research:

- Software - by exploiting existing software used by consortium members and associate partners, together with new software developed as a result of collaborative working on the project
- Hardware, by providing access to latest hardware systems and processors
- Medical device manufacturers and pharmaceutical companies, by providing access to simulation techniques
- Compute services and consultancy specific to the domain of biomedicine

The Innovation Management activities will be coordinated across all work packages as a transversal function. The coordination of the identification and management of IP will be led from WP4: Innovation and Sustainability, where the associated team will look over all parts of the project in order to identify new opportunities and to appropriately exploit them during and also after the project's execution.

UEDIN will engage regularly with project partners to ensure it understands what background IP the CoE is relying on, what foreground the CoE is developing and who owns it and what the innovation plans are for the IP during and after the project.

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A register will be maintained, recording all external technologies identified by the partners that may enhance the exploitation of IC/IP developed.

UEDIN will run regular Innovation Management meetings and reviews on a 3-monthly cycle, where the team will meet to discuss and record innovation progress.

CompBioMed's Partners and Associate Partners will be actively encouraged to engage with a broad range of actors; government and industry lobbying, Independant Software Vendors (ISVs), the media, promotion, engagement with other Centres of Excellence and relevant academic/industry partnerships.

7.1 Stages in Innovation

The European IPR Helpdesk promotes a 4-stage process for Innovation Management and broadly this will be adopted, suitably adapted to the specific needs and capabilities of the consortium members. The stages are:

- **Secure the foundations** - ensuring the commercial framework is in place and all consortium members are suitably aware, trained and supported in their innovation activities
- **Capture project outputs** – ensuring the mechanisms are in place to ensure beneficial results enter the innovation process
- **Manage and protect project outputs** – ensuring the intellectual capital and property in those beneficial results hold their value for subsequent exploitation
- **Disseminate, exploit and communicate project outputs** – ensuring appropriate effort is expended in order to realize the anticipated research, societal or commercial impact

These stages have been tailored and are expanded in the paragraphs below.

7.1.1 Secure the Foundations

The Consortium Agreement defines the IP access, usage rights and policies (foreground, background, during and after project), together with the IP exploitation policy for the project.

Many of the Consortium members are research institutions with a commercial focus and as such have good IP awareness. For those individuals that feel they would benefit from further training, guidance should be sought from UEDIN.

Similarly, a large number of individuals across the consortium membership have been active in high quality research for some time and have received formal training in good research practice. Again, for those that feel they would benefit from additional training, guidance should be sought from UEDIN.

7.1.2 Capture Project Outputs

Review of research outputs will occur regularly as part of the work package, technical and applications meetings.

WP4 coordination meetings occur on a monthly basis and on a 3-monthly cycle, UEDIN will incorporate a specific session to focus on identification and capture of results.

Generators of new know-how, IC and IP will propose those that are candidates to enter the Innovation Management process. The process of identifying new inventions from within the

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research activities can benefit from the use of lateral thinking, synectics and brainstorming elicitation techniques. UEDIN will coordinate advice and support on these techniques where required.

Those results identified as candidates for entry into the innovation process will be recorded and also reported to the Executive Board meetings to ensure any additional necessary resources are assigned.

7.1.3 Manage and Protect Project Outputs

For those results entering the process, an assessment at the appropriate level of the IP and the opportunity will be undertaken, covering:

- Patentability, copyright, confidentiality, including conflict or collaboration with existing IP
- Additional formal protection and proving where it was generated
- Competitive position in light of alternative technologies
- Market(s) available for exploitation
- Innovation potential and its enhancement, together with the means to maximize impact

Consortium members should be aware that within H2020 programmes, measures for protection of IP are an allowable cost.

7.1.4 Exploitation of Project Outputs

For those candidates that show strong potential for real impact, a specific plan will be developed to ensure its exploitation to best effect. Several of the CompBioMed consortium members have established mechanisms for exploitation of research outputs within their organizations and these will be used as a first port of call by the generators of new IP and know-how on the project.

Within the wider pool of partners and associate partners, CompBioMed has extensive experience of exploitation form academic through social to commercial impact.

These specific exploitation plans will cover:

- The extent of exploitation achievable from within the project and what are the paths to further exploitation beyond the project community and project timeline
- The most beneficial business model:
    - Research collaboration
    - Dissemination
    - Consultancy
    - Licencing
    - Incubation
    - Spin-out/ start-up
    - Joint venture
- Incorporation of and with 3rd party capability/products
- Financial case and investment proposition
- Market assessment and sales & marketing campaign
- Business plan – what/when/how/who

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Where required, UEDIN will match consortium members with the wider expertise available across the project in order to plan and execute exploitation activities.

7.2 Fast and Deep Track Activities

CompBioMed has a significant advantage in terms of rapid progress as it brings together prior research from the partners to achieve early results, termed the Fast Track activities. Innovation Management in the project will focus on these activities as a priority, to identify those early outputs that are candidates to enter the innovation process and those that subsequently can be exploited early. In order to realize the benefit of the Fast Track programme, early emphasis will be given to ensuring those researchers involved are fully informed, enabled and supported in finding innovation candidates within their research outputs. Outputs entering the innovation process from Fast Track activities should be fully assessed during the first year of the project.

UEDIN will liaise regularly with the Technical and Applications Managers in order to ensure any required guidance and support is provided to the researchers involved.

The focus required to get at Fast Track outputs is reflected in the scheduled performance reviews of the innovation process detailed in section 7.5 below.

After the first year of the project, it is anticipated the Deep Track activities will begin to generate outputs that enter the innovation process. Task 4.5 Pre-commercial Activities will provide substantial support as the Deep Track activities progress, whereby key functionalities for commercialization are identified to support the Year 3 use cases.

7.3 Incubators

Incubators are where academic and industry partners will collaborate to exploit HPC and associated e-infrastructure by raising awareness in industry, especially in SMEs, making available and providing support for the use of cutting edge HPC facilities. Task 4.2 Incubator Coordination has a critical role in the final stage of the innovation process in supporting the exploitation planning and subsequently, where appropriate, coordinating the entry of innovation candidates into incubator environments that are suited to their specific exploitation needs.

7.4 Intellectual Property and Intellectual Property Rights

UEDIN coordinates the management of all Intellectual Property via the CompBioMed IP Registry.

The IP Registry contains all information regarding the IC/IP components in the project, with each component defined and detailed within it. The IP Registry is available centrally within the CompBioMed intranet and it will be continuously updated as new components are gathered following the various reviews of results.

The IP registry records status of the project IC/IP components (background/foreground/know-how), the ownership & access rights, protection arranged (or to be arranged) and the pre-publication reviews and public disclosure monitoring required.

The project General Agreement details the terms of common use, ownership of foreground/background IP and its commercialization. Consortium members can seek further

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guidance as necessary from UEDIN. The IP Registry can be found in the WP4 folder in the CompBioMed intranet knowledge base.

7.5 Performance Reviews

The early activities will focus on stages 1 and 2 of the Innovation Management process namely ensuring the project has firm foundations in framework, training and support and that all IP brought into the project is properly identified, characterized and made available for active use across the project.

UEDIN will lead a review of the performance of these activities between Months 6 and 8, undertaken by the WP4 team.

As detailed in Section 7.2 above, through Months 6-12 it is anticipated that Fast Track activities will yield candidate outputs for entry into the innovation process and progress through the stages to exploitation. In anticipation of emerging Deep Track output, UEDIN will undertake a further review at Month 12 to ensure the prescribed process is working to good effect, with amendment and enhancement as appropriate.

8 Innovation Advisory Board

The project has established an Innovation Advisory Board to provide strategic guidance and support in Innovation Management within the project. The members of the board are drawn from within and externally to the project and its composition will change in order to meet the specific needs of the emerging innovation activities as they evolve.

The Innovation Advisory Board will be increasingly consulted as the programme of innovation activities grows as the project progresses. Fast Track activities are anticipated to generate early results to enter the innovation process and it is the assessment of these results that will receive early input from the board.

The detailed Terms of Reference for the board are included at Annex B.

9 Project Key Performance Indicators

All Innovation Management activities will adhere to the overall project philosophy of working towards clear Key Performance Indicators (KPIs). Those related to Innovation Management specifically, or those to which Innovation Management has a significant contribution are included at Annex C.

10 Bibliography

- European IPR Helpdesk
  - factsheet - IP Management H2020
  - presentation – Invention & innovation in H2020 – Sweeney 2015
  - factsheet – Plan for exploitation & dissemination of results
  - presentation – Impact & innovation in H2020 – Scherer 2014

- CompBioMed Grant Agreement 675451 H2020-EINFRA-2014-2015 – Consortium Agreement

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- CompBioMed Grant Agreement 675451 H2020-EINFRA-2014-2015 – Description of Action Annex 1
- CENELEC – Integrating standards in your Horizon 2020 project
- Innovation Management standard NPR-CEN/TS 16555-1:2013 en

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Annex A – Extract from Description of Action (Part A) – WP4 Task Descriptions

Work package number [9]	WP4	Lead beneficiary [10]	3 - UEDIN
Work package title	Innovation and Sustainability		
Start month	1	End month	36

Objectives

Objectives

• Ensure that the Centre of Excellence creates and implements both a strong sense of innovation and sustains its standing at the forefront of on-demand HPC for biomedical research

• Create the Centre's Innovation Plan

• Coordinate the Centre's 'incubation' activities with SMEs and other industrial stakeholders

• Create the Centre's Sustainability Plan
Create links between CompBioMed and the ETP4HPC cPPP

Description of work and role of partners

WP4 - Innovation and Sustainability [Months: 1-36]
UEDIN, UCL, BSC, SARA, UNIGE, USFD, CBK, UPF, LTG, ACE, BULL, JAN, EVOUK
Description of work

Work package 4 will establish our Centre of Excellence's relationship with wider industrial stakeholders and commercial activities. The activities will be developed with reference to the initial business plan outlined in Section 2.2.2.

Task 4.1: Innovation Plan Development (M1-M6)
Leader: CBK (3 PM); Partners: LTG (2 PM), EVOUK (2), BULL (2), UPF (2), ACE (2), UNIGE (2)
This task will create the Centre's Innovation Plan, designed to promote interdisciplinary entrepreneurial opportunities among software vendors (via formulisation of licensing via Independent Software Vendor), hardware vendors (by providing access to latest hardware systems and chips and help hardware providers innovate to define the road to the exascale), and medical device manufacturers and pharmaceutical companies (by providing access to simulation techniques. The Innovation Plan will establish mechanisms to actively promote in silico methods to the pharmaceutical and medical device industries, and the wider research community. The Innovation Plan will be presented to the Innovation Advisory Board described in Section 3.2 which will also be in charge of IPR issues.

Task 4.2: Incubator Co-ordination (M1-M36)
Leader: SARA (4 PM); Partners: JAN (3), UEDIN (2 PM), UCL (2), LTG (2), ACE (2), CBK (2)
Our Centre of Excellence will play a role as an incubation coordinator wherein academic and industry partners will collaborate to exploit HPC and associated e-infrastructure by raising awareness in industry, especially in SMEs, making available and providing support for the use of cutting edge HPC facilities. This collective expertise will collaboratively build awareness whilst also creating solutions for real industrial problems in the biomedical domain.

Task 4.3: cPPP Engagement (M1-M36)
Leader: BULL (2 PM); Partners: UEDIN (2 PM), SARA (2), BSC (2), LTG (2), JAN(2)
This task will be responsible for creating links to the ETP4HPC contractual Public-Private Partnership, to establish a forum and mechanism for the HPC industry to interact with computational biomedicine community, whether in academia, hospitals or SMEs.

Task 4.4: Sustainability Plan Development (M1-M36)
Leader: UEDIN (4 PM); Partners: LTG (2), USFD (2), UCL (2), EVOUK (1)
This task will develop the Sustainability Operations Procedure (SOP) to ensure minimisation of damage through poor service, and will be responsible for enforcement of it. This will ensure the Centre adheres to in silico regulatory procedures (FDA for US and EMA for EU) and incorporates relevant regulatory procedures into CoE's portfolio and monitor for changes in procedures and adapt as necessary. The fundamental aim of the SOP is to perpetuate the Centre beyond the initial three funded years of the project by establishing a network of original CoE partners and building a network of trust between hardware vendors, software vendors, medical device manufactures and pharmaceutical companies. To maintain the Centre's relevance this task will monitor current computational biomedical research and employment of emergent and disruptive technologies, and incorporate any relevant emergent technologies into the Centre. In addition, the SOP will monitor and update best practice in computational biomedicine.

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Task 4.5: Pre-commercial Activities (M24-M36)
Leader: USFD (4 PM), Partners: LTG (4), CBK (2 PM), ACE (2), EVOUK (2), BULL (1)
Commercialization of support solutions in biomedicine tends to be strongly geared towards individual applications and use cases, and we believe that a wider study on the benefits of commercialization in this area will lead to increased industrial uptake. We will undertake this study as part of this task, and identify key functionalities where commercialization is viable, or even favourable, over adopting academia-driven solutions. In year 3 we will formulate a set of commercialization use cases, in collaboration with our industrial partners.

Task 4.6: Coordinate the Innovation Exchange Programme (M1-M36)
Leader: BSC (4 PM); Partners: BULL (1 PM), EVOUK (1), ACE (1), UCL (1), LTG (1)
CompBioMed will act as a focus for technology transfer between academia, healthcare and industry in the field of biomedical computing by fostering a mentoring programme, whereby experts from the research community spend time embedded within industrial organisations looking for assistance, applying the latest research techniques in their software. Likewise the Innovation Exchange programme will assist academic software developers in adopting best practice software development tools and techniques by facilitating short internships within industrial organisations. WP3 will work to develop mentoring programme opportunities, which will be posted on the ComBioMed centre website, and will be open to both internal and external stakeholders.

Participation per Partner

Partner number and short name	WP4 effort
1 - UCL	5.00
3 - UEDIN	8.00
4 - BSC	6.00
5 - SARA	6.00
7 - UNIGE	2.00
8 - USFD	6.00
9 - CBK	7.00
10 - UPF	2.00
11 - LTG	13.00
12 - ACE	7.00
14 - BULL	6.00
15 - JAN	5.00
16 - EVOUK	6.00
Total	79.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D4.1	Innovation Plan	9 - CBK	Report	Public	6
D4.2	Interim Report on Industrial and cPPP Collaboration	3 - UEDIN	Report	Public	18
D4.3	Sustainability Plan	3 - UEDIN	Report	Public	30

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List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D4.4	Final Report on Industrial and cPPP Collaboration	3 - UEDIN	Report	Public	32
D4.5	Report on Pre-commercial Activities	8 - USFD	Report	Confidential, only for members of the consortium (including the Commission Services)	36

Description of deliverables

D4.1 : Innovation Plan [6]

We will deliver an innovation plan, to be adhered to by all members of the consortium, to promote the innovation and commercialisation aspects of this project.

D4.2 : Interim Report on Industrial and cPPP Collaboration [18]

A report on our initial engagement with industrial stakeholders and ETH4HPC, and our Innovation Exchange Programme.

D4.3 : Sustainability Plan [30]

A plan to ensure the sustainability of our CompBioMed Centre of Excellence

D4.4 : Final Report on Industrial and cPPP Collaboration [32]

A detailed report on our engagement with industrial stakeholders and ETH4HPC, and our Innovation Exchange Programme, throughout the course of the CompBioMed project

D4.5 : Report on Pre-commercial Activities [36]

This report describes a proposed set of concrete commercialization use cases as defined in the project's Year 3 activities. The commercialization itself may take place in Year 3, but will not draw on funds dedicated to CompBioMed.

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS6	Innovation plan published	9 - CBK	6	D4.1
MS22	Sustainability report published	3 - UEDIN	30	D4.3
MS25	Pre-commercial activities decided	8 - USFD	36	D4.5

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Annex B - Innovation Advisory Board Terms of Reference

The following terms of reference have been developed to guide invitation, selection and management of input to the project from the Innovation Advisory Board:

- The chair of the IAB will be Prof Mark Parsons of the core partner UEDIN, which coordinates WP4 - Innovation & Sustainability
- The IAB members will be drawn from stakeholder groups from within and external to the project to ensure a positive mix of perspectives and contributions
- Initial membership of the IAB will be for 12-18 months only, thereafter existing members will be replaced to reflect the required contribution as the project progresses
- The board will be supported by internal members drawn from the CompBioMed Innovation & Sustainability management team
- Members will represent their own view and not those of their parent organizations and shall sign up to confidentiality as individuals to allow their access to information confidential to the project as required
- The IAB will be called on for advice on general and specific issues arising from Innovation Management activities with specific focus on maximising Impact; research, societal and commercial

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Annex C - Project KPIs Relevant to Innovation Management Activities

The project KPIs to which innovation activities contribute are listed below:

KEY PERFORMANCE INDICATOR	TARGET (minimum)	MONTH TO DELIVER BY
Innovation		
Impact on innovation for in silico clinical trials	Our industrial customers will report savings in development costs of at least €200k p.a. in total	36
Impact on innovation	5 of our industrial customers will each report savings in development costs of ≥ €25K p.a.	36
Fast Track codes deployed on HPC systems/PRACE	6 by month 12	12
Community codes deployed on HPC systems/PRACE	4 by month 30	30
Number of simulation workflows available through CompBioMed	6 production computational workflows.	36
Coordinate the Innovation Exchange Programme (Task 4.6) to include participants from European countries and regions with fewer HPC resources	≥ 5 EU and low resource HPC participants	36
Number of companies engaged	≥ 20 companies, at least 30% being SMEs, have accessed CompBioMed services	36
Number of hospitals and biomedical institutions accessing HPC services	≥ 4 hospitals	36
Number of patients analysed with hospital hosted patient specific workflows	≥ 500 patients	

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