



BUTTERFLIES

Project Bio-Polymers & Additive Manufacturing

DI0.1 – PQMP: Project Quality Management Plan



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BUTTERFLIES

Project Bio-Polymers & Additive Manufacturing

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General Information

Project	
Title	Advanced hybridised manufacturing techniques for next generation of bio-intelligent components
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Topic	HORIZON Research and Innovation Actions
Website address	https://BUTTERFLIESproject.eu/
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EC Project Officer	Laszlo Hetey
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Quality Control

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Disclaimer

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Executive Summary

This deliverable report relates to Project Quality Management Planning (PQMP) and forms D10.1 of the project deliverables. The purpose of the PQMP is to ensure all aspects of quality management are considered and structured to ensure i) management of project-related documentation, ii) monitoring and control of project deliverables and milestones, iii) risk contingency management. The PQMP is based on the terms set out in the Grant Agreement and Consortium Agreement and includes provisions for roles and responsibilities, procedures and organisation to ensure quality management

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List of Abbreviations

2PP:	2 Photon Polymerisation
AM:	Additive Manufacturing
BJT:	Binder Jetting
ESLM:	External Stakeholder Liason Manager
GenA:	General Assembly
IsubC:	Innovation sub Committee
MC:	Management Committee
PC:	Project Coordinator
SoA:	State of Art

I. Description of Project

I.1 Project Summary

The BUTTERFLIES project aims to drive Europe towards sustainability and technological progress through bio-intelligent Manufacturing, using biological systems to create innovative production technologies. These aims will be achieved by addressing the challenges currently preventing widespread uptake of biopolymers in advanced additive manufacturing (AM). The bio-inspired advancements are based on chitin, one of the most abundant biopolymers on Earth (second only to cellulose) and applied specifically to binder jetting (BJT) and 2-photon polymerisation (2PP) AM processes.

Environmental sustainability will be achieved through chitin nanocrystal crosslinkers that bind chitin biopolymers in BJT and photocurable chitosan biopolymers in 2PP. These approaches will offer streamlined production to replace petroleum-based plastics and non-environmentally friendly binders.

The project outcomes aim to transform and revolutionise European manufacturing and products through the seamless integration of biomaterials into additive manufacturing processes. This addresses the challenges associated with processing biomaterials, such as chitin and chitosan, in processes like BJT and 2PP.

Environmental sustainability will be achieved using low-temperature, bio-based binders, which will offer streamlined production to replace petroleum-based plastics and binders with chitin.

The project will focus on the development of smart bioproducts and hybrid manufacturing techniques through key technology developments:

- BJT and 2PP for bio-intelligent 3D manufacturing to manufacture complex structures from biomaterials with embedded intelligence from bioprocesses and mimicry of real biological systems;

- Novel biomaterial binders, Process design for BJ and 2PP-based 3D printing of biomaterials, Process scalability of the 2PP technique based on laser beam shaping and multi-beam processing.

I.2 Project Objectives

There are seven project objectives as detailed in the Grant Agreement and shown in Table 1 :

Table 1: Summary of BUTTERFLIES objectives

No.	Objective	Benefit
1	Optimise ChNC binders for BJT	Advancement of current SoA biopolymer applications contributes to the European Union's broader goals of reducing environmental impact and enhancing industrial competitiveness.
2	Optimise a photo-curable chitosan biopolymer for 2PP	Advancement of biopolymer processing for precision applications such as tissue engineering and organoid printing.
3	Develop a BJT 3D printer optimised for biomedical applications, including orthosis	Advancement of additive manufacturing technologies that produce high-performance, biocompatible and environmentally friendly products.
4	Develop a 2PP chitosan technology for organoid scaffold printing	Advancement of the capabilities of bioprinting technology in producing complex, biocompatible scaffolds for biomedical applications.
5	Develop an AI/ML-driven digital platform to optimise biopolymer processing and enhance the bioprinting process of chitin and chitosan	Leverages digital tools to improve efficiency and sustainability, enhancing the competitiveness and digitalisation of European industry and contributing to a reduction in environmental footprint.
6	Implement a life cycle and life cost assessments (LCA and LCC) of the case studies to validate the solutions developed	A comprehensive evaluation of the developed solutions' environmental and economic impacts shows the technical viability and sustainability.
7	Develop and implement a comprehensive strategy for exploiting, disseminating and	Provides the platform for widespread industry adoption and alignment with EU sustainability goals

training intelligent technologies	BUTTERFLIES' manufacturing	bio-
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I.3 Project Consortium

The project consortium has 12 beneficiaries that collectively bring together the skills and expertise to deliver the project's objectives. The consortium consists of companies based across Europe with backgrounds in industry and academia.

Table 2: BUTTERFLIES consortium partners

No.	Partner	Short Name	Country
1	The Manufacturing Technology Centre Limited	MTC	UK
2	Fraunhofer Gesellschaft Zur Forderung Der Angewandten Forschung EV	Fraunhofer	Germany
3	Vital 3D Technologies, UAB	V3D	Lithuania
5	3 Drivers – Engenharia, Inovacao E Ambiente SA	3DR	Portugal
6	Fundacion Tecnia Research & Innovation	TEC	Spain
7	ASA Spezialenzyme GMBH	ASA	Germany
8	ValueData GMBH	VALUE	Germany
9	Iconiq Innovation Ltd	IIL	UK
10	Concr3de b.v.	C3D	Netherlands
11	European Federation For Welding, Joining and Cutting	EFW	Belgium
12	Optimus 3D SL	OPTI	Spain
14	Experimentica UAB	EXP	Lithuania
Associated Partners			
13	EMPA – Swiss Federal Laboratories for Materials Science and Technology	EMPA	Switzerland

I.4 Work Packages

The project consists of 11 work packages made up of 7 technical WP's, 2 dissemination and exploitation WP's and 2 project management WP's as listed in Table 3:

Table 3: Overview of BUTTERFLIES work packages

WP	Name	Lead Beneficiary	Timespan
1	Industrial Requirements Capture and Specification	MTC	M1 – M3
2	Development of Chitin Binder	EMPA	M1 – M36
3	Binder Jet Development for Chitin Printing	Fraunhofer	M1 – M36
4	2 Photon Polymerisation for Chitosan Printing	V3D	M10 – M34
5	Digital Biosphere Platform Development	VALUE	M4 – M36
6	Lifecycle and Lifecost Assessment	3DR	M4 – M36
7	Industrial Demonstration	MTC	M27 – M36
8	Exploitation, Dissemination & Training RP1	EFW	M1 – M18
9	Exploitation, Dissemination & Training RP2	EFW	M19 – M36
10	Project Management and Coordination RP1	MTC	M1 – M18
11	Project Management and Coordination RP2	MTC	M19 – M36

I.5 Use Cases

The project will demonstrate the technical outputs through two use-case demonstration structures.

Case Study 1 will demonstrate the production of chitosan-based organoid scaffolds through a full-scale 2PP machine, which will be set up and calibrated for optimised photosensitive resins, and a tailored CAD design will guide the fabrication process to achieve the required pore size, geometry & mechanical properties.

Case Study 2 will demonstrate a patient-specific thumb orthosis which will be created using the BJT process, ensuring correct material properties, thickness and structure. The orthosis will be subjected to mechanical testing to ensure compliance with industry standards as well as biomechanical testing to ensure fit and functionality, including wearer comfort and hygiene.

I.6 Methodology and Results

The project is divided into distinct phases, the first two of which provide the basis for subsequent phases. The phases are as follows:

- Phase 1: Requirements & specifications. *Aims to gather & analyse technical and functional needs, equipment capabilities, material specifications & component geometries.*
- Phase 2: Technology development. *Development & optimisation of core technologies that meet the technical project objectives.*
- Phase 3: Industrial demonstration & validation. *Demonstration & validation of the technologies developed to ensure they comply with Phase 1 requirements and are ready for scale-up.*

The methodology is shown in Figure 1 below:

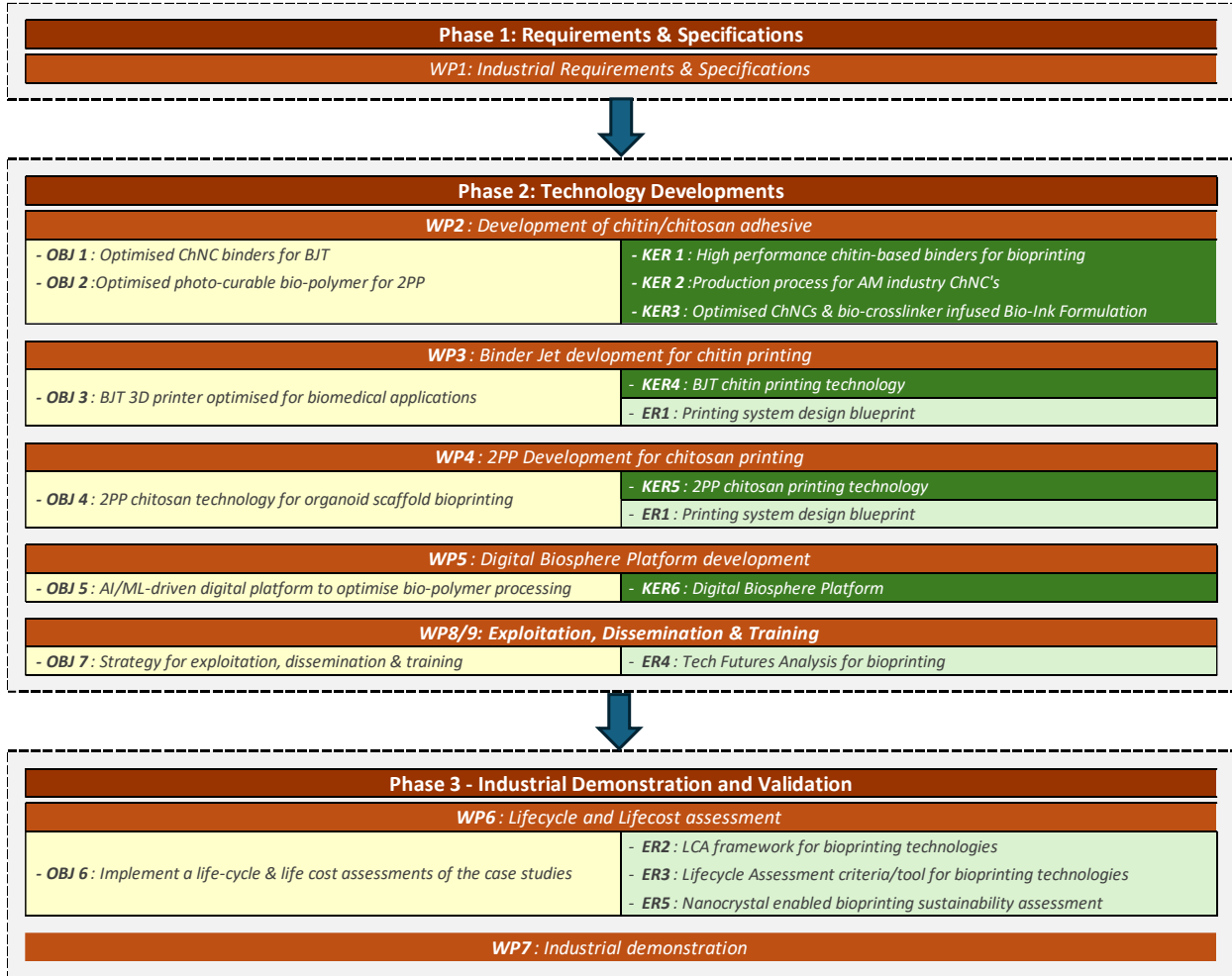


Figure 1: Methodology showing phases, WP's and links to objectives & Key Exploitable Results (KERs).

2. Project Management and Governance

2.1 Project Management Strategy

The project management strategy will ensure the delivery of all technical and financial aspects of the project as described in the Grant Agreement and within the allotted time frame. Relevant clauses detailed in the Consortium Agreement also form part of the strategy. Specific project management tasks are set out in WP's 10 & 11 of the Grant Agreement, covering reporting periods 1 (M1–M18) and 2 (M19–M36) of the project. These WPs are led by MTC, who is the project coordinator.

The strategy has been developed with the following considerations:

- Effective communication *across WP teams and the consortium as a whole.*
- Quality management *of deliverables, project results, risk management and mitigation.*
- Change control, *deviations, amendments, budget changes, corrective action decision making.*
- Reporting, *across the consortium, across WP teams, wider stakeholders and the project sponsor.*

All decisions during the project life cycle will be taken following consultation with all relevant stakeholders to ensure complete buy-in by the consortium and to foster a team approach. Decisions taken by the leaders and teams of the technical work packages will be communicated through the General Assembly forum set up for the project, where relevant.

2.2 Project Management Structure

The project management structure of the BUTTERFLIES consortium is made up of two main committees; the General Assembly (GenA) consisting of all partners in the project and a Management Committee (MC) composed of Work Package Leads, the project coordinator, technical manager and technical lead of MTC who have in-depth knowledge of the wider technical objectives and tasks. WP leads will lead sub-committees dedicated to each of the technical and dissemination & exploitation WPs in the project, made up of all the contributing consortium members to a specific WP.

The structure is also supported by an Innovation Sub Committee (IsubC), which will be organised and led by the Innovation Manager (Stephen Ryley, IIL) and an External Stakeholder Liaison Manager (ESLM) undertaken by Fátima Zorro (EWF).

Figure 2 represents the Project Management Structure:

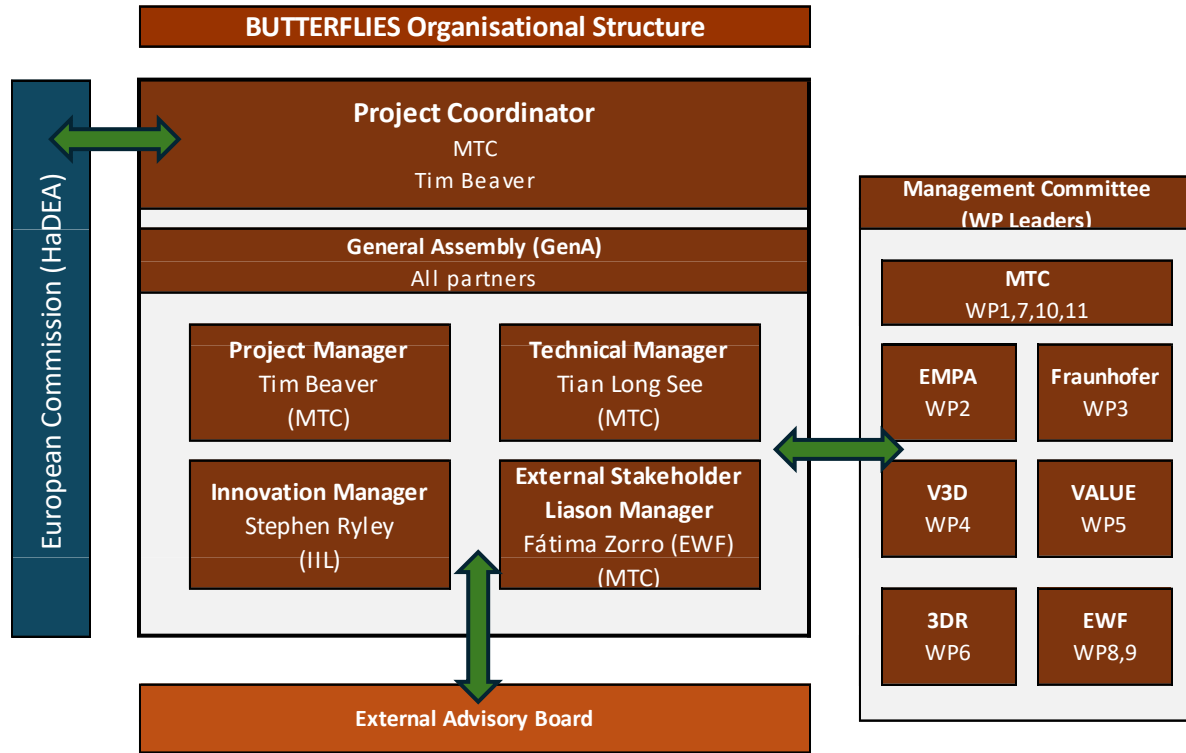


Figure 2: Project Management Structure.

3. Management Processes and Tools

3.1 Deliverable Preparation

The project consists of 42 Deliverable Reports, each of owned by the responsible partner detailed in the Grant Agreement, responsible for its timely submission to the PC, who then takes responsibility for submission to the Funding & Tenders portal.

A deliverable template is available for download on the TEAMS channel to which all project partners have access.

The first drafts of each deliverable will be shared with all partners for review and invitation for comment. Once received, the final draft will be shared again and submitted for approval with two reviewers best placed within the consortium. Only when that review is successful will a deliverable be uploaded to the HORIZON project portal. Deliverable preparation timings are shown in Table 4:

Table 4: Deliverables Preparation

Stages	Due Date to Deadline (Days)
First draft for review by consortium	-20d
Final draft for review by designated approvers <i>(shared with consortium)</i>	-15d
Completed review by designated approvers	-10d
Approval by PC and upload to HORIZON portal	-5d

Any deviations from the preparation plan will be communicated to the PC by the deliverable owner so that the appropriate assessments and mitigations can be made if required.

3.2 Document Formats and Naming Conventions

Table 5 (below) shows the document formats to be used in the project:

Table 5: Document Formats

Type	Format	Production Tool	Version
Documents	.docx	Microsoft Word	Word 2010 or later
Scientific papers	.docx	Microsoft Word	Word 2010 or later
Data in tabular form and graphics	.xlsx	Microsoft Excel	Excel 2010 or later

Presentations	.pptx	Microsoft PowerPoint	PowerPoint 2010 or later
Images	.jpeg, .png etc	Any software tools that can produce images	various
Portable Document Format	.pdf	Any software that can produce .pdf files	various
Compressed files	.zip	Any software that can produce .zip files	various
Video	.mp4 or similar	Any software tool that can produce video	various

To ensure consistency and ease of identification of documents the naming convention for documents shall be as follows:

BUTTERFLIES_[name of document]_ DATE_ [partner acronym]_Vxy.FileExtension

- The name of the document shall be as concise as possible but also self-explanatory i.e., Kick_Off_Project_Meeting_Minutes
- The date should be presented in the form YYYYMMDD i.e., 20250714.
- The partner acronym should be used as defined in the GA i.e., MTC for Manufacturing Technology Centre.

3.3 Reporting to the EC

The project has two reporting periods:

- Reporting Period 1 (RP1) – Month 1 to Month 18.
- Reporting Period 2 (RP2) – Month 19 to Month 36.

A periodic Report will be uploaded to the HORIZON portal by the PC within 60 days of the end of each reporting period. The report will be collected following contributions from each WP Lead. The PC will coordinate the production of the report, which will be subject to the same deadlines and preparation plan as the project deliverable reports. All partners will be requested to contribute to the report and will do so using a report template circulated by the PC.

3.4 Conflict Resolution

The PC is responsible for ensuring that the project is fully implemented in line with the tasks and objectives set out in the Grant Agreement. Clause 11.8 of the Consortium Agreement states that *parties shall endeavour to settle their disputes amicably*, and it is expected that, due to the collaborative nature of the project, any conflicts can and will be resolved quickly.

It is likely, however, that there will be occasions where conflicts arise, in which case the following escalation process will be followed.

1. Task Leader consultation with beneficiary(s) in conflict.
2. WP Leader in consultation with Task Leader.
3. Project Coordinator in consultation with WP Leader.
4. General Assembly.

Task Leaders & WP Leaders will inform the PC in the event of conflict so that other resolutions can be proposed and the impact on the project considered, and where applicable, mitigated. All handling of conflict will be undertaken in line with the Grant Agreement and Consortium Agreement.

4. Communication Processes and Tools

4.1 Communication with HaDEA

All communication with the project sponsor (HaDEA) will be done solely through MTC as the PC. The PC is responsible for the timely upload of all project deliverables and periodic reports as well as any interim reports via the HORIZON project portal. The PC will disseminate any relevant communications from HaDEA to all relevant beneficiaries and partners.

4.2 Internal Communication

The main method of communication is via e-mail which thus provides a history of communications within the project. A TEAMS channel (BUTTERFLIES project) has been created which serves primarily as a repository for documentation associated with the project and secondly for a more direct form of communication where required.

4.2.1 Project Repository

All documentation, data and information to be shared between partners will be uploaded to the BUTTERFLIES project TEAMS channel. This media provides the consortium with a secure repository for documentation under three main channels (*General, Project meeting, Work Packages*). Further channels can be added as necessary.

4.2.2 Online Meeting Platform

Microsoft Teams will be used as the platform for online meetings. Other platforms are accessible when and if TEAMS is either not available or accessible; these include Zoom and Skype. The PC meeting organiser will send all invites to online meetings and be responsible for granting access to such meetings for each attendee.

4.2.3 Organisation of Meetings

The PC will organise all meetings of the GenA and MC. WP Leaders will organise meetings for each subcommittee dedicated to each WP. A meeting schedule will be issued by each organiser. Scheduling of meetings will be carried out via e-mail and, where necessary, supported by polls for availability using online platforms such as Doodle.

4.2.4 Meeting Schedule

The meeting schedule is designed to comply with the terms of the Grant Agreement and to ensure a regular schedule that suits the project pace without over-burdening the consortium with meetings.

GenA meetings will be in-person and will be held every 6 months, and hosted by different partners. These events will encourage team building and increase knowledge through site visits and facility tours (where possible). All beneficiaries will be encouraged to provide in-person presence. The GenA meetings will be organised by the PC with assistance from the host.

Monthly online meetings will be held for the MC (organised by the PC) and subcommittee meetings (organised by the WP Leaders).

Any beneficiary or partner can organise meetings outside of the set schedule and is encouraged to do so.

Table 6 shows the BUTTERFLIES meetings schedule:

Table 6: BUTTERFLIES Meetings Schedule

Type	Time	Organized by	Participants	Location	Purpose
Kick-off meeting	M2 (11.06.2025)	MTC	All	Brussels (Tecnalia) + hybrid	Partner introduction, Teambuilding, Work package presentations & expectations of EC.
GenA meeting	Every 6 months	MTC + host	All	TBC	Top-level progress review & next steps discussions. Team Building.
MC	Monthly	MTC	All	Online, MS- Teams	Regular updates on project progress, Input from all running WPs, project management, requirements and risk management
WP Sub-committee	Monthly	WP Leader	WP-partners, partners from affected WPs if necessary	Online, MS Teams	Technical progress review of WP & risk management.
Ad hoc meeting	As necessary	All partners	Partners involved	Online, MS Teams	Immediate communication

4.3 External Communication

4.3.1 Dissemination

Dissemination activities will form the greater part of external communications, and WPs 8 & 9 are dedicated to this activity and will be led by EWF.

A dedicated website will be created for the project, and updates will be posted regularly. A social media presence will be enabled through the LinkedIn platform.

Each partner will be asked to provide material for dissemination through the above media, and updates will be posted on the achievement of project milestones and events.

Dissemination activities will be further enhanced by in-person attendance at trade shows and conferences where scientific papers may be presented following agreement as to their content by the relevant stakeholders.

4.3.2 Scientific Publications

Any beneficiaries or partners compiling scientific publications will reference the project as the origin of the results in the acknowledgements section of the paper and/or presentation. The project acronym (BUTTERFLIES) as well as the grant No (101178321) will be referenced using the following statement:

“This research was carried out in the framework of the BUTTERFLIES project (grant number 101178321) and has received funding from the European Health and Digital Executive Agency (HaDEA).”

5. Mechanisms for Quality Management

5.1 Roles and Responsibilities

The PC is responsible for ensuring the implementation of and compliance with the PQMP. The PC will provide all the templates to be used to ensure compliance and consistency of document formats.

WP Leaders are responsible for the quality of the outputs of the tasks and deliverables within their respective WPs, including risk management, a review of which will form part of the MC scheduled meetings.

Each partner is responsible for ensuring the implementation of the requirements stated in this document.

5.2 Plan-Do-Check-Act Cycle

The project will follow a *Plan-Do-Check-Act* cycle to ensure quality assurance. This will apply in particular to the sub-committees led by the WP Leaders. The *Plan-Do-Check-Act* cycle is explained thus:

Plan: *Determination of goals, requirements, changes and methods*

Do: *Execution of work according to requirements and methods defined in the planning phase*

Check: *Evaluation of the results of the undertaken measures in regard to requirements*

Act: *Taking actions depending on the result of the evaluation. If necessary, start the cycle again by planning necessary changes to comply with requirements.*

In monthly meetings, the cycle will be recorded using an Excel-based template, which will be uploaded to the TEAMS channel following each meeting. The updated document will also be emailed to all relevant stakeholders to ensure a consistent level and history of communication.

5.3 Continuous Improvement Process

The project will be enhanced by an openness to a continuous improvement process (CIP). The PC will welcome all ideas and recommendations for CIP and will be responsible for its implementation and updates to the PQMP where applicable.

5.4 Quality Criteria

All results and outputs will be recorded in the deliverable reports for the project. The methodology for producing final deliverables is explained in section 4.1 of this document. The

quality of output and results will be referenced against the relevant tasks and objectives stated in the Grant Agreement and their relevance to the current SoA and scientific validity.

All documents, presentations and other media that represent outputs of the project will be assessed based on compliance with templates, project design and requirements & specifications of the European Commission. All documents will be checked for errors and linguistic accuracy.

5.5 Quality Control

The review process for each deliverable report will ensure compliance with the Grant Agreement and the standards set out in the PQMP. The designated reviewers of deliverables at the final draft are set out in Table 7:

Table 7: List of deliverables and reviewers

Del No	WP	Deliverable Name	Lead Beneficiary	Due Date	Reviewers Partner - Personnel
D1.1	1	Specification, Business and Operational Requirements	MTC	M3	Fraunhofer - Kirstin Protte Freitag TEC - Pierre Barralon
D2.1	2	Non-reactive ChCN/Chitosan Binder	EMPA	M18	ASA - Arno Cordes Fraunhofer - Kirstin Protte Freitag
D2.2	2	V1 ChNC/Chitosan Binder	EMPA	M22	MTC - Reza Nekouie Esfahani Fraunhofer - Kirstin Protte Freitag
D2.3	2	Final ChCN Chitosan Binder	EMPA	M28	C3D - Matteo Baldassari Fraunhofer - Kirstin Protte Freitag
D2.4	2	V1 Photo Curable Binder for 2PP	EMPA	M28	V3D - Vidmantas Sakalys) MTC - Reza Nekouie Esfahani
D2.5	2	Final Photo Curable Binder for 2PP	EMPA	M36	Fraunhofer - Kirstin Protte Freitag ASA – Merdan Urcanli
D2.6	2	Machine Learning for Reactive Adhesive Optimisation	EMPA	M30	VAL - Kevin Baßler MTC - Hoda Amel
D3.1	3	Process and Machine Requirements Specification	Fraunhofer	M6	MTC – Hoda Amel TEC - Iñigo Agote
D3.2	3	Binder-Jetting Lab Machine Fully Operational	Fraunhofer	M18	C3D – Matteo Baldassari TEC - Iñigo Agote
D3.3	3	Bio-Polymer Optimisation	Fraunhofer	M36	MTC - Reza Nekouie Esfahani EMPA - Gustav Nystrom

D4.1	4	2PP Machine with Optimal Femtosecond Laser Setup for 2PP	V3D	M18	Fraunhofer - Jan Janhsen EXP - Sarunas Tumas
D4.2	4	2PP Test Coupons	V3D	M28	Fraunhofer - Jan Janhsen EXP - Sarunas Tumas
D4.3	4	Report on Inflow 2PP Printing Technology for Fast Scaffold Printing	V3D	M34	TEC - Pierre Barralon Fraunhofer - Kristin Protte Freitag
D5.1	5	Digital Biosphere Database	VALUE	M15	MTC - Reza Nekouie Esfahani EMPA - Gustav Nystrom
D5.2	5	Ensemble Model	Fraunhofer	M36	MTC – Tian Long See TEC – Pierre Barralon
D6.1	6	Initial LCI & LCA Framework	3DR	M18	MTC – Tian Long See IIL – Laura Pilon
D6.2	6	LCA & LCC Report	3DR	M25	MTC – Tian Long See TEC – Pierre Barralon
D6.3	6	Recommendations	3DR	M36	IIL – Laura Pilon VAL - Kevin Baßler
D7.1	7	Organoid Prototypes and Production Plan	V3D	M34	EMPA - Gustav Nystrom EFW - Fátima Zorro
D7.2	7	Organoid Specific Testing	EXP	M36	Fraunhofer - Kristin Protte Freitag MTC - Reza Nekouie Esfahani
D7.3	7	Orthosis Prototypes and Production Plan	OPTI	M34	IIL – Laura Pilon Fraunhofer - Jan Janhsen
D7.4	7	Orthosis Product Specific Mechanical Testing	OPTI	M33	C3D - Matteo Baldassari OPTI - Izaskun Arriaga
D7.5	7	Wear Test of Persons and Subjective Feedback	OPTI	M36	Fraunhofer - Jan Janhsen MTC - Reza Nekouie Esfahani
D8.1	8	Iterative Reporting on T-FA	IIL	M4	MTC - Tian Long See EFW - Fátima Zorro
D8.2	8	Plan for Dissemination and Exploitation	EFW	M6	IIL - Stephen Ryley MTC - Tim Beaver
D8.3	8	Project Completion Dissemination Activities Review	EFW	M18	TEC - Inigo Agote Fraunhofer - Oliver Schwarz
D8.4	8	Training Skills Strategy	EFW	M18	MTC - Sam Rupprecht EMPA - Gustav Nystrom
D8.5	8	Sector Sustainability Assessment Recommendation for Exploitation	EFW	M18	IIL - Laura Pilon OPTI - Izaskun Arriaga
D9.1	9	Iterative T-FA reporting (interim at M22)	IIL	M34	MTC - Tian Long See C3D - Matteo Baldassari
D9.2	9	Plan for dissemination and exploitation (interim PDEC 24, 30)	EFW	M36	MTC – Tian Long See OPTI - Izaskun Arriaga
D9.3	9	Final T-FA reporting	IIL	M34	MTC – Tian Long See

					Fraunhofer - Oliver Schwarz
D9.4	9	Training skills strategy update	EWF	M3	MTC – Hoda Amel Fraunhofer - Oliver Schwarz
D10.1	10	PQMP	MTC	M6	EWF - Fátima Zorro TEC - Inigo Agote
D10.2	10	Data management plan	MTC	M12	VAL - Kevin Baßler 3DR - Giovanni Borsoi
D10.3	10	A gender equality plan	MTC	M36	EWF - Fátima Zorro Fraunhofer - Kristin Protte Freitag
D10.4	10	Short management report 1	MTC	M36	TEC - Inigo Agote Fraunhofer - Oliver Schwarz
D10.5	10	Short management report 2	MTC	M36	TEC - Inigo Agote Fraunhofer - Oliver Schwarz
D11.1	11	Gender quality plan (Interim at M24)	MTC	M36	EWF - Fátima Zorro Fraunhofer - Kristin Protte Freitag
D11.2	11	Revised Data Management Plan	MTC	M36	TEC - Inigo Agote EWF – Fátima Zorro
D11.3	11	Revised PQMP	MTC	M36	IIL - Laura Pilon EMPA - Gustav Nystrom
D11.4	11	Short management report 4	MTC	M24	TEC - Inigo Agote Fraunhofer - Oliver Schwarz
D11.5	11	Short management report 5	MTC	M36	TEC - Inigo Agote Fraunhofer - Oliver Schwarz

6. Risk and Issues Management

6.1 Risk and Issues Management Plan

Fifteen critical risks have been identified and detailed in the Grant Agreement. Proposed mitigation measures are also detailed, and WP Leaders will be responsible for ensuring those mitigations are put in place as part of their work plans.

WP Leaders will be responsible for the monthly update of a risk register specific to the WP they are leading. The updates will form part of the monthly sub-committee WP meeting and communicated to the PC by e-mail and upload of the document to the TEAMS channel. The PC will review all risks every month and help with mitigations when required.

It is expected that each beneficiary and partner will maintain a project risk register specific to their internal work plans and procedures. Any risk that affects the wider project or consortium can be raised and detailed in the WP risk register, if necessary, to ensure wider awareness and appropriate mitigation.

Risks will be assessed and scored using common practice through the use of a risk assessment matrix. Each risk will be assigned a likelihood (L) of occurrence and severity (S) of consequences. The risk rating (R) is calculated as the sum of likelihood x severity.

Figure 3 shows the Likelihood & Severity matrix.

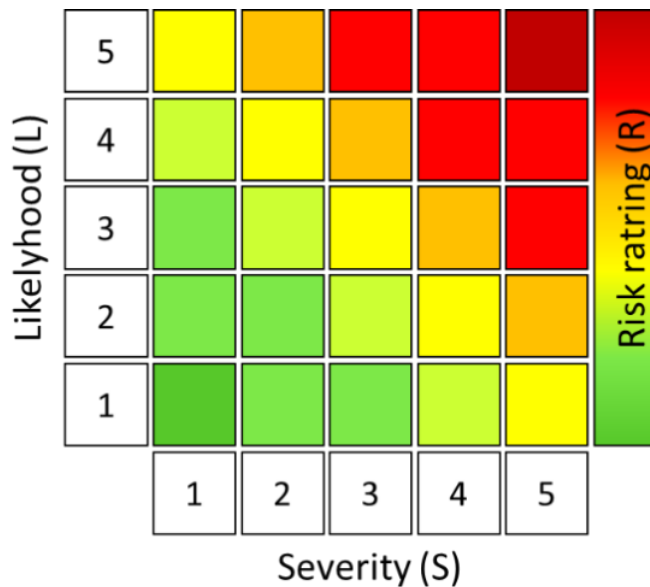


Figure 3: Risk Likelihood & Severity matrix

6.2 Identified Critical Risks & Proposed Mitigation Measures

The list of critical risks and proposed mitigation measures is shown in Table 8. WP Leaders are responsible for transferring the relevant risks onto their respective WP risk register and calculating the risk rating in collaboration with their WP subcommittee.

Monitoring and control results will be documented in the GenA meeting. Any issues that arise will be discussed and resolved as a separate agenda item during this meeting.

Table 8: Critical risks and mitigation measures proposed in the grant agreement

Risk no.	Description	WPs	Proposed Mitigation Measures
1	ChNC/Chitosan adhesive does not achieve the expected performance, resulting in excessive porosity of the final part	2,3	Modify particle size, adjust chitosan loading and ratio of ChNC, Chitosan and dispersing agent.
2	The curing time of reaction chitin adhesive is too long.	2	Optimise adhesive ingredients, utilise additional crosslinkers or consider using mild heat.
3	Dense layers (50-100 μm) of chitin powder cannot be printed with BJT	3	Further optimisation of chitin powder to achieve the desired layer density. Mitigate to alternative printhead types with a broader performance window
4	Chitin-based binder cannot be processed with piezo inkjet technology due to inadequate viscosity control or nozzle clogging	2,3	Modification of viscosity, particle size, stabilising agents and reactants choice. Utilise different materials as adhesives and dispersants. Mitigate to alternative printhead types.
5	Mismatch between conditions for long adhesive handling time and time to cure	2	Optimise ingredients and choose more balanced solvents.
6	Inconsistent flow rate of the adhesive and powder in the BJT machine	3	Optimise the calibration process and implement flow monitoring
7	2PP process delivers inconsistent cross-linking of chitosan during processing	4	Optimise laser parameters and photo initiator concentration
8	Femtosecond laser processing parameters cause premature degradation of chitosan	4	Optimise laser intensity /exposure time to avoid thermal degradation and maintain polymerisation.
9	Database is not large enough for a good ensemble	5	Fallback to pure Bayesian optimisation
10	BUTTERFLIES printing processes do not produce components that meet the	8	Analysis of economic impacts of process implementation in different

	functional performance required to drive industrial demand for uptake.		manufacturing sectors (sustainability reporting, WP8) will demonstrate the added value throughout manufacturing value chains
11	Processing rates of the BJT and 2PP machines do not meet commercial demand and cost	8	Identification of processing bottlenecks and continuous system improvement post-project by C3D and V3D.

7. Effort and Cost Management

7.1 Effort and Cost Management Overview

The total staff effort for the project is recorded in man-months for each participant in the Grant Agreement. The effort is broken down into WPs and provides participants and the PC to measure the effort undertaken as the project progresses. The PC will request updates on the effort spent to date (by resource) within each WP on a 6-month basis from each participant.

The budget is shown in Annexe 2 of the Grant Agreement and is split down by work-package for each participant. The PC will request the spend to date for each partner at 6 monthly intervals in order to determine and forecast any potential overspends, which, along with the effort spent analysis, will indicate if financial virements may be required between WP's or participants.

7.2 Effort and Cost Monitoring and Reporting

The PC will provide all participants with the necessary templates for effort and spend reporting. These will be issued at the end of M6, M12, M18, M24, M30 and M36 of the project. Participants will have 15 working days to return the completed template, in following which the PC will compile an overview of effort and spend on the project and review accordingly to ensure the total effort and spend can be achieved within the total project budget.

8. Conclusions

This document sets out how the delivery and governance of the BUTTERFLIES project will be implemented and managed which in turn will ensure the contractual obligations and expectations of the funding authority are met.

A clear project structure is set out with roles and responsibilities detailed along with the ability for all stakeholders to express their views and clear strategies in place for the resolution of conflict.

The project quality management plan and procedures therein align with standard practice for collaborative projects of this nature and the BUTTERFLIES consortium members are familiar with these methods of governance.