# EVOLUTION PLAN

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# INTRODUCTION

The COCOON EU research project on Biodesign and Biomaterials recognizes the essential role of an evaluation plan in ensuring the success and relevance of its objectives. Within the framework of the project, Work Package 4 (WP4) focuses on the implementation of Living Labs pilots, which serve as real-world platforms for testing and refining the project's innovative approaches and the developed Biomodules to transform Design Education, Makers Spaces and Professional Design contexts.

A robust evaluation plan is integral to this process, as it provides a structured mechanism for collecting, analyzing and presenting data that are critical for monitoring progress, facilitating iterative improvements, and validating the outcomes of the pre-experimental, and experimental LLs pilots. This systematic approach ensures that the methodologies, tools, and educational strategies developed in COCOON meet the intended goals of promoting sustainable practices and advancing the fields of biodesign and biomaterials.

The evaluation plan is firmly grounded in the foundational outputs of COCOON, particularly the teaching and learning methodology outlined in Deliverable 3.3 (D3.3) and the training curriculum detailed in Deliverable 3.2 (D3.2). These deliverables collectively shape the pedagogical framework of the project, emphasizing innovative and inclusive educational strategies for integrating biodesign and biomaterials into design education and professional practices. The evaluation plan leverages these pillars to align data collection and analysis processes with the project's core teaching and training objectives, ensuring coherence and relevance across all levels of implementation.

A critical feature of the evaluation plan is its use of mixed-methods research, incorporating both qualitative and quantitative approaches to gather comprehensive insights. This integration allows the project to address multiple dimensions of evaluation, including participant experiences, learning outcomes, and the practical applicability of the developed methodologies and Biomodules. By combining diverse methods, the plan ensures the collection of data that are both broad in scope and deep in detail, enabling a nuanced understanding of the Living Labs' performance.

The qualitative component of the evaluation plan draws heavily on ethnographic research techniques, group dynamics feedback, and in-depth personal interviews. These methods are designed to capture rich, contextualized insights into participant interactions, behaviors, and perceptions. Ethnography provides a lens for understanding the social and cultural dynamics within the Living Labs, while group dynamics feedback facilitates collective reflections that can reveal shared experiences and emergent themes. In-depth interviews further complement these approaches by uncovering individual perspectives and motivations, adding depth to the evaluation process.

The quantitative component is anchored in communication techniques such as surveys, which allow for the systematic collection of measurable data from a larger participant base. Surveys are particularly useful for identifying trends, assessing satisfaction levels, and evaluating specific aspects of the Biomodules and learning scenarios. The combination of these qualitative and quantitative methods ensures a comprehensive evaluation framework that addresses both macro-level trends and micro-level insights.

Through this multidimensional approach, the evaluation plan aims to validate the Biomodules and the Learning scenarios adapted and created by the Educators for the diverse typologies of Living Labs within WP4. By assessing these pilots against relevant criteria / dimensions such as: (a) Satisfaction; (b) Technical quality; (c) Emotional Journey; (d) Competences and Skills acquisition and (e) Usability, the plan not only ensures the quality and impact of the project's educational outputs but also provides actionable insights for future iterations and broader applications. This iterative evaluation process underscores COCOON's commitment to excellence, innovation, and the integration of sustainability and Nature in design education and practices – the transformational foundations of Biodesign.

# BENEFITS

The COCOON evaluation plan offers a range of significant benefits, serving as both a strategic and operational tool to guide project implementation across all partners and Living Labs pilots. By providing a unified framework, the plan establishes common guidelines that ensure consistency and coherence in data collection and analysis, fostering alignment with the project's overarching goals. This commonality facilitates the exchange of knowledge and best practices among partners while maintaining flexibility for local adaptation. As a resource toolkit, the evaluation plan enables each project partner to tailor methodologies and tools to their specific pilot needs, ensuring that the evaluation process remains contextually relevant while adhering to shared principles. This adaptability supports the validation of the COCOON learning methodologies and their replication in diverse educational and professional settings.

A key feature of the evaluation plan is its emphasis on leveraging digital platforms for data collection and monitoring. Tools such as online forms, analytics, and dashboards enable real-time tracking of project progress, offering immediate insights to guide decision-making and adjustments. This capability enhances the quality of data collected, ensuring its alignment with the project's strategic goals and final outcomes. Furthermore, the evaluation plan plays a critical role in the validation and improvement of COCOON's learning outcomes within WP04, offering a structured approach to refining the Biomodules and learning scenarios. By providing robust evidence and results, the plan also supports communication and dissemination activities, enabling partners to engage in peer discussions and share findings with academic, professional, and policy-making audiences, thereby amplifying the project's impact and fostering broader adoption of its methodologies.

# EVALUATION PLAN FOR SUPPORTING THE TEACHING AND LEARNING COCOON METHODOLOGY

The COCOON project's evaluation plan was meticulously designed to support the implementation of the teaching and learning COCOON methodology, which is structured around the Four Implementation Stages: Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation. Each stage reflects a critical dimension of the pedagogical process and integrates tailored evaluation strategies, methods, and tools. Additionally, the sequence and application of these stages are adjusted according to the specific typology of the Living Labs (e.g., Courses, Workshops, Seminars) and the target group's objectives, which include Secondary Education students, Vocational Education and Training (VET) participants, Higher Education learners, and professional practitioners. The evaluation framework aligns with the procedural phases—pre-pilot, during-pilot, and post-pilot implementation—to enable comprehensive data collection and analysis that informs both the effectiveness of the methodology and its impact on knowledge, skills, and personal development.

## Implementation Stages

In the stage of **Abstract Conceptualization**, the evaluation plan prioritizes the assessment of participants' initial understanding of Biodesign and Biomaterials concepts. For this stage, pre-pilot evaluation tools include surveys and diagnostic questions (forms) to measure baseline knowledge and perceptions. During the pilot, qualitative techniques such as group dynamics and brainstorming sessions are utilized to gauge how participants synthesize theoretical content and connect it to their learning objectives. Post-pilot evaluation includes reflective questionnaires and concept-mapping exercises to evaluate the extent of conceptual integration and the depth of understanding achieved by participants. These methods provide critical insights into how abstract concepts are internalized and scaffolded within various educational and professional contexts.

The **Active Experimentation** stage involves participants applying learned theories and methods in practice-based scenarios, requiring evaluation methods that focus on engagement, experimentation outcomes, and skill application. Pre-pilot assessment identifies participants' readiness for experimental tasks through competency surveys and self-assessments. During the pilot phase, rubrics and observational checklists are employed to evaluate participants' engagement, problem-solving approaches, and innovative experimentation processes within the Living Labs. Post-pilot evaluation involves product-based assessments and peer reviews to determine the quality and originality of outputs, as well as participants' ability to implement theoretical knowledge in practical applications.

For the **Concrete Experience** stage, the evaluation plan emphasizes experiential learning and hands-on involvement in Biodesign and Biomaterials projects. Pre-pilot activities measure participants' prior experience with similar methods and materials, utilizing tools such as experience inventories and background interviews. During the pilot, evaluators use participatory observation and real-time feedback tools to monitor participants' immersion in the tasks and their interactions with the learning environment. Post-pilot evaluations include reflective journals, project showcases, and participant-led presentations to assess the depth and breadth of experiential learning outcomes. These tools provide rich qualitative and quantitative data on how the hands-on activities foster critical skills and competences.

In the **Reflective Observation** stage, the focus shifts to participants analyzing and reflecting on their learning experiences. Pre-pilot evaluation involves setting baselines for reflective capacity using tools such as self-reflection prompts and initial interviews. During the pilot, structured reflection sessions, learning diaries, and collaborative discussions are incorporated to monitor how participants critically evaluate their experiences and identify areas for improvement. Post-pilot evaluation includes in-depth interviews, reflective essays, and thematic analysis of learning logs to assess the participants' ability to articulate insights and integrate them into their future learning and professional practices.

## Process phases

The procedural phases - Pre-pilot, During-pilot, and Post-pilot implementation—ensure a systematic approach to data collection and analysis. In the Pre-pilot phase, diagnostic assessments establish baseline metrics for knowledge, skills, and motivation. The During-pilot phase employs dynamic and iterative evaluation techniques to capture real-time progress and adaptation. Finally, the Post-pilot phase consolidates data to measure the overall impact of the methodology, focusing on knowledge acquisition, skill development, and participants' motivation for future engagement with Biodesign and Biomaterials in Design Education programs and Maker spaces. By aligning the evaluation plan with the Four Implementation Stages and the procedural phases, the COCOON project ensures a robust framework for assessing the methodology's effectiveness across diverse educational and professional settings.

| | PRE-PILOT | | DURING-PILOTP | | | OST-PILOT | |
| | Quanti | QualiQ | uantiQ | | ualiQ | uantiQ | uali |
| | Surveys | In-depth | Surveys | Ethnography | In-depth | Surveys | In-depth |
|---|---|---|---|---|---|---|---|
| Satisfaction | | | ● | | | ● | |
| Technical Quality | | | ● | ● | | ● | |
| Emotional Journey | | | | ● | ● | | ● |
| Competences | ● | ● | ● | ● | ● | ● | ● |
| Usability | ● | ● | ● | | ● | ● | ● |

*Figure - Evaluation overall design, source - the authors*

In short, the evaluation plan for the COCOON methodology is a multi-faceted approach that combines stage-specific methods with procedural rigor. It is designed to capture the transformative impact of the methodology on learners across different contexts, while providing actionable insights to refine the teaching and learning processes. The plan's focus on pre-experimental and experimental data collection ensures a holistic understanding of the participants' journey, contributing to the broader goals of advancing Biodesign and Biomaterials expertise in contemporary Design Education and practice.

# PROCESS EVALUATION FRAMEWORK

## Metric System Philosophy in Participatory Design for WP04 Living Labs

The COCOON, work package 04 Living Labs implement a metric system philosophy rooted in a participatory design approach. This methodology ensures that teachers, educators, facilitators, makers, and students are active participants in the evaluation of pre-experimental and quasi-experimental Living Labs pilots. The metric system is instrumental in controlling performance and measuring the outcomes of participatory design processes. It employs a mix-methods approach that integrates both micro and macro key performance indicators (KPIs), providing a comprehensive framework for assessing the success of each stage in the participatory process.

The participatory design methodology in the Living Labs involves a co-creative approach that integrates educators and students into the COCOON Teaching and Learning methodology four-stage process. Each of these stages follow a dynamic funnel philosophy, moving progressively from macro-level conceptualization to micro-level implementation. The methodology involves obtaining, filtering, and clustering information; establishing connections; testing and voting on preferences; and integrating the selected constructs through systematization and visual mapping. This structured approach enables the definition and monitoring of specific KPIs at each stage, ensuring clarity in performance measurement and outcome evaluation.
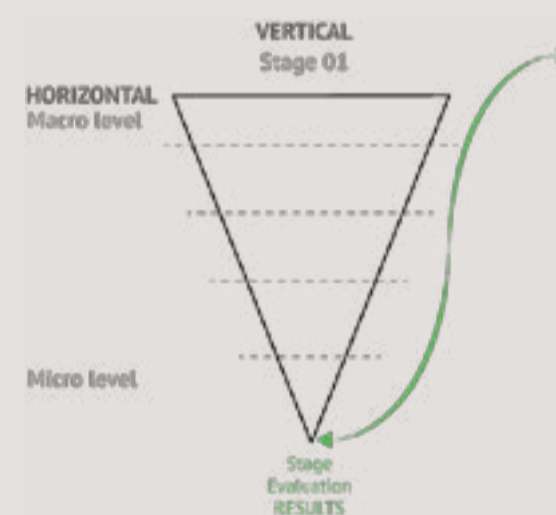


*Figure - PDMS - Principles, source: Mateus (2016)*

Each stage of the Living Labs is characterized by a continuous flow of measurement through objective and subjective indicators, textual expressions, and anthropological evidence such as experience narratives and emotional journeys. These indicators are interrelated and analyzed through content analysis to determine the extent of alignment with baseline expectations. The performance of each stage is evaluated based on the gap between expected baseline values and actual measured outcomes. This gap-based evaluation framework provides a detailed understanding of the strengths and weaknesses of the participatory design process at various stages.

The key performance indicators (KPIs) are defined for each stage with an initial baseline value, a performance objective, and post-implementation measurements. For example, in the ideation stage, the KPI may be the number of ideas generated. The performance metric is calculated by subtracting the measured value from the baseline expectation, yielding a gap value that reflects the stage's effectiveness. This quantitative approach ensures precise performance tracking and facilitates adjustments to optimize outcomes.

The metric system uses a summated scale averaged index to aggregate the performance gaps across all indicators and stages. The Performance Gap Index (PGI) is calculated using the formula:

$$KPI\ PGI = (KPI1 + KPI2 + \ldots + KPIn) / N$$

This equation provides a holistic measure of the overall performance of the participatory design process. By aggregating individual KPI gaps, the PGI offers insights into the cumulative effectiveness of the Living Labs' methodologies, enabling iterative improvements and data-driven decision-making.

The evaluation of KPIs in the Living Labs is based on three primary types of measurements. First, technical quality and self-expressive aspects are observed to assess the participants' engagement and innovation in applying the methodology. Second, subjective metrics such as general satisfaction, recommendations, and emotional states after the experience are captured through self-administered questionnaires. Third, the level of consensus achieved among participants is measured, providing insights into the collective efficacy of the co-creation process.

The participatory design approach incorporates both quantitative and qualitative data, allowing for a nuanced understanding of the learning and teaching outcomes. Interaction observations provide valuable context for interpreting the quantitative KPI gaps, while personal narratives and emotional journeys add depth to the evaluation process. This mix-methods approach ensures that the evaluation captures both the tangible and intangible aspects of the Living Labs' impact.

By employing a participatory design methodology, the COCOON Living Labs foster a collaborative environment that empowers all stakeholders to contribute meaningfully to the evaluation process. Teachers, educators, and facilitators play a critical role in guiding the co-creation process, while students and makers provide valuable feedback and innovative ideas. This inclusive approach ensures that the metric system reflects the diverse perspectives and contributions of all participants, enhancing its relevance and applicability.

In conclusion, the metric system philosophy applied in the COCOON Living Labs combines rigorous performance measurement with a participatory design approach to ensure comprehensive evaluation and continuous improvement. By integrating micro and macro KPIs, anthropological evidence, and content analysis, the system provides a robust framework for assessing the success of the pre-experimental and quasi-experimental pilots. This holistic methodology ensures that the Living Labs achieve their objectives of fostering Biodesign and Biomaterials expertise within educational and professional contexts.

# Metric System Processes and Procedures

The COCOON evaluation framework utilizes a meticulously designed metric system, which incorporates macro and micro processes to streamline the participatory design methodology. These processes ensure an organized flow of information and facilitate performance monitoring at each stage. The approach is founded on a dynamic funnel philosophy that combines divergent and convergent thinking to generate, cluster, and refine information, ultimately achieving consensus among participants. This structured methodology is essential for supporting the evaluation process and delivering measurable outcomes.

**Macro Processes and Information Flow**
The macro processes constitute the overarching structure that integrates the sequences of micro processes for each stage of the participatory design methodology. Each stage culminates in a deliverable report that consolidates the results achieved through consensus. This report becomes the foundation for initiating subsequent stages, each with its unique tools and micro processes. The continuous flow of information across all stages ensures coherence and alignment with the overarching objectives, enabling the innovation process to reach its results systematically. The macro processes are instrumental in generating a seamless information flow and delivering actionable insights at every milestone.

**Micro Processes and Consensus Generation**
The micro processes are pivotal to the participatory methodology, consisting of eleven sequential steps tailored to each project or innovation challenge. Guided by the dynamic funnel philosophy, these processes emphasize divergent and convergent thinking techniques. Initially, participants engage in divergent thinking, generating a diverse array of ideas, concepts, and insights related to the problem or case under consideration. Subsequently, through convergent thinking, these constructs are clustered into common categories, facilitating agreement among participants. The final steps involve establishing logical hypotheses, identifying cross-connections, and reaching consensus on the clustered information. These structured steps ensure that the participatory process is both inclusive and goal-oriented.

**Measures within the Dynamic Funnel Concept**
The metric system employs both macro and micro measures to evaluate the outcomes of the participatory design process. At the macro level, the results of each stage are analyzed to calculate performance deviations from baseline expectations, generating a Performance Gap Index (PGI). This index provides an aggregate measure of the process's overall performance. At the micro level, the results of each step are assessed using similar performance deviation calculations, enabling continuous control and refinement. This dual-layered measurement approach ensures that performance is monitored and optimized throughout the process.
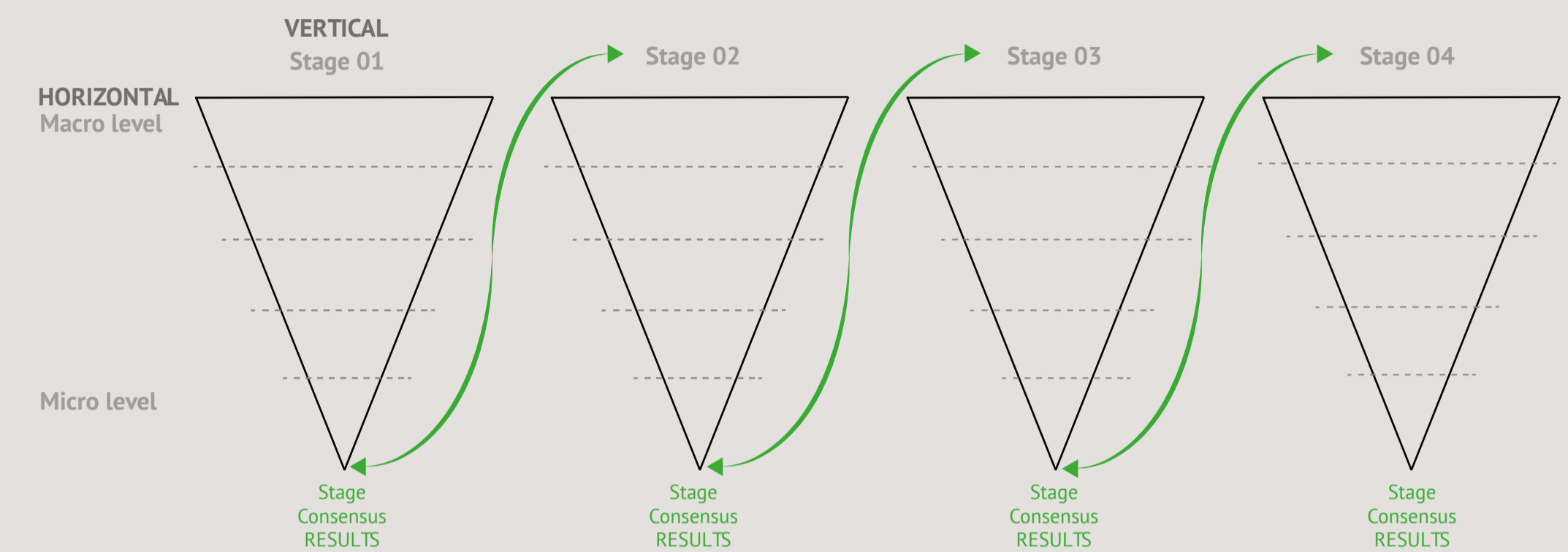


Figure - PDMS - Dynamic Funnel,  Source - Mateus (2016)

**Instruments and Measurement Scales**
A comprehensive set of validated instruments is utilized to collect data and evaluate the participatory design methodology. These instruments include self-administered rating scales for evaluating the importance of inputs such as ideas and visual stimuli, emotional state assessments based on Ekman's face typology, and questionnaires for technical quality and self-expression evaluation. Additionally, general satisfaction, recommendations, and consensus levels are assessed through Delphi and Triz matrix formularies. The combination of these tools ensures a holistic evaluation of both the technical and experiential dimensions of the participatory design process.

The integrated metric system is designed to support the COCOON participatory design research team in planning, implementing, and monitoring evaluation actions. By facilitating interaction and communication among stakeholders through web-based platforms, and face-to-face interactions, the system enhances data collection and analysis. Real-time monitoring of deviations and alerts enables prompt adjustments and ensures that performance targets are met. Local facilitator teams and COCOON observatory leaders are responsible for defining baseline objectives and performance targets for each stage, ensuring alignment with the overall project goals. This structured and adaptable approach underpins the success of the COCOON participatory design, based methodology.

# COCOON evaluation plan pillars

## Mix-Methods definition

Mix-methods research integrates qualitative and quantitative approaches to address research objectives comprehensively. This methodology combines the rigor of statistical data with the depth of contextual analysis, enabling triangulation for robust insights. Within the COCOON framework, mix-methods ensure a multidimensional evaluation of participatory design processes, incorporating structured surveys, observational studies, and narrative techniques. This methodological pluralism facilitates capturing complex phenomena such as emotional engagement, consensus-building, and innovation testing.

In the context of the COCOON evaluation plan, this approach enables a robust examination of stakeholder engagement, innovation processes, and outcomes by leveraging the strengths of diverse data collection and analysis techniques. Mixed-methods research is particularly suited for addressing multifaceted challenges where one methodological perspective alone may not provide sufficient depth or breadth of insight.

At its core, the mixed-methods approach operates on the principle of triangulation, which ensures that data from different sources or methods are cross-validated to enhance reliability and validity. In the COCOON framework, this involves the integration of qualitative methods, such as ethnographic observations, interviews, and storytelling, with quantitative techniques, including surveys, usability testing, and performance metrics analysis. This methodological synergy allows for a nuanced understanding of both the subjective experiences of stakeholders and objective measures of program performance.

## Key Characteristics of the Mixed-Methods Approach

•Complementarity: The mixed-methods approach combines qualitative and quantitative techniques to address different but complementary aspects of the evaluation. For instance, while quantitative surveys provide statistical insights into stakeholder engagement levels, qualitative interviews offer rich, contextual narratives that explain the underlying motivations and behaviors.

•Iterative Process: Mixed-methods research is often iterative, with findings from one method informing the design or focus of subsequent methods. For COCOON, early qualitative data, such as ethnographic diaries or affinity diagrams, may guide the development of targeted surveys or weighted matrices to quantify specific trends or themes.

•Integration of Data: A defining feature of mixed-methods research is the integration of data during analysis. In the COCOON evaluation plan, this entails combining qualitative insights from methods like participant observation with quantitative findings from user journey maps or KPI tracking to form a cohesive narrative about the effectiveness and impact of the innovation process.

•Dynamic Adaptability: Mixed-methods research is inherently flexible and adaptive. It allows evaluators to pivot between methods as new insights emerge. For example, COCOON evaluators might use storytelling techniques to capture stakeholder feedback during the diagnostic phase and later validate these findings through quantitative content analysis.

•Enhanced Validity: By using multiple methods, mixed-methods research strengthens the validity and reliability of findings. Cross-coding, contrasts analysis, and thematic networks within COCOON ensure that qualitative and quantitative data are not only corroborative but also synergistically informative.

## Application in COCOON Evaluation

The mixed-methods approach is integral to the COCOON evaluation plan because it aligns with the project's dynamic, iterative, and participatory philosophy. For example, the use of ethnographic methods allows evaluators to immerse themselves in stakeholder contexts, while quantitative measures such as KPIs and usability reports provide objective benchmarks for progress. Techniques like affinity diagramming and neuronal networks further facilitate the synthesis of diverse data streams, enabling evaluators to uncover patterns and actionable insights.

By embracing a mixed-methods approach, COCOON ensures that its evaluation plan is both rigorous and responsive, capable of capturing the complexity of innovation processes while remaining grounded in real-world stakeholder experiences and outcomes. This dual focus enhances the credibility and utility of the findings, supporting informed decision-making and continuous improvement.

## Communication and Observation Methods

In research, communication and observation methods serve as foundational techniques for data collection and analysis, especially within qualitative studies. These methods, while distinct in their approach, both contribute to the understanding of the phenomenon under investigation.

**Communication Methods**
Communication methods in research primarily refer to the processes by which information is exchanged between researchers and participants. These methods are crucial for gathering insights, clarifying concepts, and establishing rapport in qualitative studies. Communication methods can be categorized into **verbal and non-verbal** forms. Verbal communication encompasses interviews, focus groups, surveys, and questionnaires, where the researcher directly engages with participants. Communication methods are critical for establishing the validity and reliability of research findings, as they enable researchers to obtain firsthand accounts from participants. They also allow for clarifications and follow-up questions, ensuring that the data collected is as accurate and complete as possible.

**Observation Methods**

Observation methods involve the systematic study of participants' behavior, actions, and interactions within their natural environment. This method is particularly prevalent in ethnographic, sociological, and psychological research, as it allows researchers to gain insights into real-world contexts. Observation can be **participant or non-participant**, based on the researcher's involvement in the study. For COCOON we will use the Participant **Observation approach,** meaning the COCOON researcher becomes actively involved in the group or community being studied. This immersive approach allows for a deep understanding of the social dynamics and cultural practices of the group. While this method enhances the richness of data, it also presents ethical challenges regarding researcher bias and influence on the group's behavior. COCOON also combines with **Non-participant Observation,** one of the COCOON researchers maintains a passive role, merely observing the actions and behaviors of participants without direct involvement.

Observation methods are advantageous because they provide direct access to real-world behaviors, bypassing the limitations of self-reporting. They allow researchers to capture spontaneous and unconscious actions, offering a level of data richness that verbal communication methods may not reveal. However, they can be resource-intensive and may suffer from observer bias or ethical concerns regarding privacy and consent.

For COCOON, both communication and observation methods are essential tools in qualitative research. Communication methods provide direct insights into participants' thoughts, feelings, and experiences, while observation methods offer a deeper understanding of behavioral patterns within real-world contexts. The effective application of these methods will contribute significantly to the credibility and depth of research findings. COCOON researchers must carefully consider the context, research objectives, and ethical implications when selecting and implementing these methods to ensure the integrity and reliability of their studies.

## Key Performance Indicators (KPIs)

Key Performance Indicators (KPIs), as defined by Ronald (1961) and Peterson (2006), are quantifiable metrics that measure performance against predefined objectives. KPIs are instrumental in tracking progress, identifying gaps, and providing actionable insights to stakeholders. Within the COCOON methodology, KPIs are utilized across all process stages to measure technical quality, emotional engagement, satisfaction, and consensus levels. By calculating the deviation between baseline expectations and actual outcomes (Performance Gap Index), KPIs enable continuous monitoring and iterative improvements throughout the participatory design process.

**Communication Method Instruments**

•Delphi Method: A structured method of achieving consensus, adapted from Dalkey and Helmer (1963). It involves multiple rounds of stakeholder input, validation, and refinement, culminating in a final selection of ideas. In COCOON, the Delphi Method fosters broader participation and ensures robust validation of innovation concepts.

•Storytelling: A qualitative approach used to segment user experiences into "before," "during," and "after" phases. This framework enables designers to analyze emotional and practical feedback across the life cycle of an idea or product, supporting diagnostic and validation phases.

•User Journey Mapping: A visualization tool that captures user experiences, behaviors, and emotional states during interactions with products or services. It identifies pain points and opportunities for improvement, contributing to the holistic evaluation of participant engagement.

**Observational Research Instruments**

•Participant Observation: This immersive ethnographic technique allows researchers to observe behaviors and cultural nuances by directly engaging in activities. Systematic documentation ensures a comprehensive understanding of participant motivations, interactions, and perceptions. In COCOON, this method complements other ethnographic tools to capture real-time insights during workshops.

•Ethnographic Research: A depth-oriented approach that integrates direct observations and narrative accounts to uncover organizational culture, emotional environments, and contextual dynamics. Cross-referencing primary data with secondary data enhances the validity of findings.

•Role-Playing: Participants simulate real-life scenarios, assuming user roles to explore routines and behaviors. This low-cost method uncovers user-centered insights and fosters empathy, aiding narrative-driven analysis.

•Inspirational Cards "The Clearing" - This learning tool creates space for reflection and creative thought by drawing inspiration from forests. It uses insights from natural ecosystems to explore novel ways of imagining a circular economy and Biodesign. The tool is structured around 18 themes. These themes guide participants to apply insights from nature to their own contexts, moving from abstract thinking to concrete solutions. The cards each start by introducing a story from nature and activating intuitive knowledge in this domain. This is followed up by a reflective prompt and a real-world example of circular economy practices in line with this prompt. The Clearing can be used individually and in group settings as a way to arrive at radically new ideas for a circular economy and challenge old patterns of thought. Acknowledgements: This learning tool has been developed as part of the doctoral research of Emma Fromberg, funded by Delft University of Technology and the University of Cambridge Institute for Sustainability Leadership. This tool is designed and published as part of EU-funded project CoCoon, a strategic alliance that combines research on biology, education, bio-design and innovative infrastructures.

### Content Analysis and Analytical Tools

•Contrasts Analysis - Contrasts analysis involves the juxtaposition of positive and negative aspects of the collected information to highlight differences and similarities. This method enables a deeper understanding of participant perceptions by placing opposing perspectives side by side, revealing insights into the case under study and providing a balanced view of the gathered data.

•Content Analysis: This technique systematically interprets qualitative data, such as transcripts and workshop outputs, by identifying themes and patterns. Inductive or deductive coding frameworks provide structured analyses, supporting triangulation and thematic clustering across COCOON phases.

•Weighted Matrix: A prioritization tool that evaluates design opportunities against success criteria. The matrix facilitates structured discussions among teams, enabling evidence-based decision-making.

•Affinity Diagramming: A clustering method to organize research themes and tacit knowledge. Movable clusters allow iterative refinement, supporting collaborative analysis during contextual inquiry and workshop activities.

### Results Analysis and Visualization

•Cross Coding - Cross coding refers to a systematic process of qualitative content analysis wherein data from diverse sources, such as field result materials, wall-size tools, video and audio recordings, and external observations, is categorized and analyzed. This technique employs key wording and categorization methods to synthesize and interpret complex datasets, enabling researchers to identify themes, patterns, and connections across various datasets.

•Matrixes - Matrixes serve as an effective tool for organizing, synthesizing, and visually presenting research outcomes. By structuring data into easily interpretable formats, matrixes enable researchers to uncover patterns, relationships, and innovation axes within the collected data. This technique simplifies complex findings, facilitating comprehensive analysis and communication of results.

•Visual Analysis - Visual analysis is a method that employs metaphors and visual semantics to represent interactions and research outcomes. This approach allows for an intuitive presentation of data through graphical elements, ensuring that the findings are accessible and comprehensible to a diverse audience. Visual templates and maps are often utilized to depict results in alignment with the project's typology and specific challenges.

•Neuronal Networks - Neuronal networks represent a dynamic and visually engaging method of showcasing research insights. Rooted in design philosophy, these networks illustrate the interconnectedness of ideas, clusters, and information flows. Thematic network analysis, a specific application of neuronal networks, follows a step-by-step methodology to organize and summarize qualitative data into web-like visualizations.

These networks highlight the relationships between themes and serve as a powerful tool for presenting complex data.

•Word Clouds/Tags - Word clouds, also known as tags, are a textual visualization technique that arranges words or word pairs in a spatial format, with font size indicating frequency of occurrence in the source material. This method provides a concise visual summary of textual data, allowing researchers and stakeholders to quickly grasp key themes and ideas. Word clouds are valuable tools for design teams, aiding in the clarification and communication of research findings. The technique also serves as a connection point to key insights, often referred to as "Golden Nuggets."

•Thematic Network Analysis - A structured method for analyzing textual data, thematic network analysis systematically identifies and connects prevalent themes in qualitative datasets. The process involves summarizing textual data into themes and organizing them into visual, web-like illustrations. By providing a clear and formulaic approach to textual analysis, this technique supports the identification of patterns and the development of cohesive insights into research findings.

•Golden Nuggets - Golden nuggets refer to the most valuable and actionable insights derived from the research process. These insights are often highlighted through techniques such as word clouds and thematic network analysis, emphasizing their significance in driving innovation and decision-making within the evaluation framework

Each concept and instrument within this glossary underpin the COCOON metric system's emphasis on systematic, participatory evaluation. Together, these methodologies contribute to a robust, multi-layered framework for evaluation the impact of COCOON's transformational journey.

# SETTING THE SCENE

## Implementation Guidelines for COCOON EU Project Evaluation Report

The implementation of the COCOON EU project evaluation guideline requires each partner's team to adopt a structured and coordinated approach. The first step is the definition of roles and responsibilities within the team. Each partner must designate an "Evaluation Plan Responsible Investigator (IR)" who will oversee the adaptation, implementation, and monitoring of the evaluation processes. This IR will work closely with the broader team to ensure the guidelines align with the specific requirements of their Living Labs and target audiences. It is critical for the IR to leverage the team's expertise in mixed-methods research, particularly ethnographic techniques and tools, to ensure the robustness of the evaluation process.

Once the IR is in place, the entire team must collaborate to adjust, adapt, and parameterize the guideline methods and tools to fit the unique context of each partner's Living Labs. This process involves tailoring methods to address the specific needs and characteristics of the target audiences. The team's experience with ethnographic research techniques, such as participant observation, in-depth interviews, and group dynamics, should be central to this adjustment process. Adaptation should also consider the socio-cultural context of the Living Labs to ensure relevance and effectiveness.

Each partner team must assign specific roles to team members, including facilitators for the qualitative approaches, observers for ethnographic data gathering, and personnel responsible for data analysis and presentation of findings. This delegation of tasks ensures clarity in responsibilities and enhances the efficiency of the evaluation process. The IR should guide this role allocation to ensure alignment with team members' expertise and experience. Additionally, designated personnel must be prepared to handle the comprehensive data collection and synthesis required for robust analysis.

A project timeline must be established by the IR and the evaluation team, aligning with the COCOON teaching & learning methodology stages and the three main phases of Living Labs implementation: pre-implementation, during implementation, and post-implementation. This timeline should include clear milestones for the application of evaluation methods and instruments, such as ethnographic interviews, workshops, and surveys. The timeline is essential to ensure timely data collection and analysis, enabling iterative feedback and refinement of project activities.

The evaluation team must adapt all surveys, questionnaires, and tools to the native language of the stakeholders involved in the Living Labs. This step is crucial for ensuring inclusivity, comprehensibility, and effective communication with participants. The team must also gather baseline information from all stakeholders, including their names, ages, emails, and socio-demographic data. This information is necessary for planning ethnographic interviews, in-depth interviews, and evaluation workshops. The construct of these activities should align with the project's overarching research objectives and the contextual dynamics of each Living Lab.

Finally, the IR and evaluation team must identify and establish the best platform or communication channel for maintaining direct contact with Living Labs stakeholders. This channel should facilitate the resolution of doubts, address participant questions, and allow for the collection of improvement ideas and feedback. Effective communication is critical to fostering stakeholder engagement and ensuring the iterative refinement of the project activities. The chosen platform should be accessible and user-friendly, ensuring that all stakeholders can participate effectively in the evaluation process.

# CONSTRUCT OF THE EVALUATION PLAN

The COCOON EU Project evaluation plan is designed to assess both abstracted variables and concrete variables, capturing participants' experiences, engagement, and skill development within the Living Labs. By focusing on these dimensions, the evaluation ensures a comprehensive understanding of the project's impact, usability, and methodological effectiveness. The evaluation will employ a mixed-methods approach, integrating qualitative and quantitative techniques to provide robust and actionable findings:

**Abstracted Variables**

**1. Satisfaction**
The Satisfaction dimension focuses on measuring the degree of agreeability among Living Lab participants. This variable examines participants' overall satisfaction with their involvement and assesses whether they would recommend the Living Labs experience to others. Specific metrics include:
    **a.** Participants' ratings of satisfaction using Likert scale-based surveys (e.g., "Strongly agree" to "Strongly disagree").
    **b.** Likelihood of recommending the Living Lab activities to peers.
Data collection will include post-session surveys, structured questionnaires, and follow-up interviews to capture both quantitative satisfaction ratings and qualitative feedback. This approach ensures a clear evaluation of the perceived value and success of the Living Lab experience.

**2. Emotional Journey**
The Emotional Journey dimension evaluates participants' emotional experiences throughout their involvement in the Living Labs. The focus is on identifying when participants felt emotions such as happiness, sadness, uncertainty, confidence, positivity, or negativity. Key components include:
    **a.** Mapping emotional highs and lows during activities (e.g., through emotional mapping exercises).
    **b.** Reflective journals or diary studies where participants record emotional responses after sessions, using Ekman's faces visuals.
    **c.** Post-activity interviews to explore the specific moments contributing to these emotions.
This dimension allows the evaluation team to identify patterns in participants' emotional engagement, helping refine methodologies to enhance positive emotional experiences and mitigate challenges.

**Concrete Variables**

**1. Technical Quality**
The Technical Quality dimension assesses the effectiveness and relevance of the methodologies and tools used within the Living Labs, as well as participants' engagement levels. It also measures participants' ability to express their visions, opinions, and ideas. Key evaluation metrics include:
    **a.** Participant engagement levels (measured through attendance, active participation rates, and observer feedback).
    **b.** Participants' evaluation of the tools and methods through surveys or group dynamics discussions.

    **c.** The degree of self-expression participants experienced during activities, measured using Likert scale-based surveys (e.g., "Strongly agree" to "Strongly disagree").
Facilitators and observers will collect real-time feedback through participant observations, post-session surveys, and group dynamics, ensuring a holistic understanding of technical quality.

**2. Competences Acquisition**
The Competences Acquisition dimension focuses on the empowerment of participants through the acquisition of new competences and skills. This evaluation is aligned with GreenComp and competences related to biodesign and biomaterials. Key components include:
    **a.** Participants' self-assessment of skill acquisition pre- and post-Living Lab sessions.
    **b.** Facilitators' or peers' evaluations of demonstrated skills during activities.
    **c.** Follow-up interviews to understand participants' ability to apply the acquired skills in real-life contexts.
The evaluation will employ structured competency frameworks, reflective exercises, and targeted interviews to assess the participants' growth and empowerment.

**3. Biomodules Usability**
The Biomodules Usability dimension focuses on evaluating the structure, content, guidelines, recipes, and overall usability of the Biomodules developed in COCOON Deliverable D3.4. Key evaluation metrics include:
    **a.** Participants' perceptions of the clarity, accessibility, and practical utility of the Biomodules.
    **b.** Usability testing through practical implementation of Biomodule guidelines during activities.
    **c.** Participant feedback on challenges, suggested improvements, and overall satisfaction with the Biomodules.
Data will be collected through usability testing narratives (infographic canvas) in the living labs sessions, google forms survey, ensuring that the Biomodules meet participant needs and are effective for future scaling.

| Abstract | Measuring the: | Type of Question |
|---|---|---|
| Satisfaction | the degree of agreeability and involvement | Do you like?; Do you reccomend? |
| Emotional Journey | emotional experiences throughout their involvement | How did you felt? Why? |
| Concrete | | |
| Technical Quality | effectiveness and relevance of methodologies and tools | Best? Improvements? Eliminate? |
| Competences | empowerment, acquisition of competences and skills | What did you learn? |
| Usability | perception of clarity, accessibility, and practical utility | Will you use it in the future? Why? |

*Figure - Variables Construct, Source: the authors*

# Gathering, Analyzing and Presenting – Techniques and Methods

The COCOON EU Research Project Evaluation Plan is structured to ensure a systematic flow of information across its phases: "gathering information", "analyzing information", and "presenting information". This flow is essential to transform raw data into actionable insights that can inform project decisions and improvements. Each phase employs specific techniques and instruments to facilitate the accuracy, clarity, and comprehensiveness of the evaluation process.
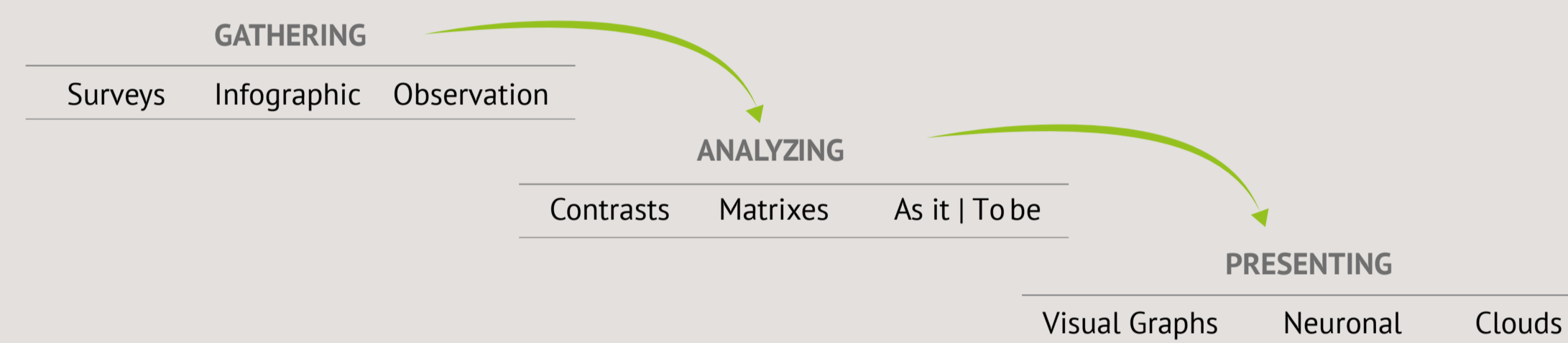


*Figure - Information Flow, Source: the authors*

### Gathering Information

The information-gathering phase focuses on collecting diverse data to capture the experiences, feedback, and insights of participants. The primary instruments include "surveys", which will be administered mainly through the "Google Forms platform". This tool ensures ease of use, accessibility, and efficient data collection for both qualitative and quantitative responses. Additionally, during group dynamics workshops, the use of the "A1 Infographic Canvas" will allow participants to visually represent their perceptions, ideas, and suggestions collaboratively. This method promotes engagement and creativity while enabling the research team to document group interactions effectively. Complementing these tools are "notes and images from "ethnographic observations", where facilitators and observers document participants' behaviors, interactions, and expressions during the Living Labs. These observations serve as qualitative data points, enriching the evaluation with contextual insights that surveys might not capture.

### Analyzing Information

The analysis phase transforms the collected information into structured and meaningful findings. One of the key techniques employed is "contrast analysis", which organizes data into positive and negative categories to identify strengths, weaknesses, and areas requiring attention. To further systematize the data, "matrixes" will be used for decoding and prioritizing responses, allowing for the identification of key themes and the most critical insights. Additionally, the "As Is/To Be technique" will be applied to analyze the

current state ("As Is") of the Living Labs and envision desired future states ("To Be"). This technique enables the identification of opportunities, pathways for improvement, and actionable strategies to bridge gaps between the present situation and project goals. Together, these analytical tools ensure a comprehensive evaluation of the gathered information, providing a clear understanding of successes and challenges within the project.

### Presenting Information

The final phase focuses on presenting analyzed data in a clear, engaging, and actionable manner. The use of "visual graphs" (such as bar charts, pie charts, and line graphs) provides a quantitative representation of survey results, making patterns and trends easily interpretable for stakeholders. In addition, "neuronal maps" will be utilized to visualize relationships and connections between key themes, insights, and project outcomes. These maps are particularly effective in illustrating complex interdependencies that arise during the evaluation. Lastly, "word clouds" will be employed to present qualitative data, such as open-ended survey responses, ethnographic observations, or workshop feedback. Word clouds highlight recurring keywords and concepts, offering an accessible visual summary of the most prominent ideas.

### Integration and Information Flow

The information flow within the COCOON evaluation plan ensures seamless progression from data collection to interpretation and presentation. Data gathered through surveys, group dynamics tools, and ethnographic observations feed directly into analytical frameworks such as contrast analysis and matrix prioritization. The findings generated from these methods are then synthesized and presented through visual formats, ensuring accessibility for stakeholders. This iterative process not only supports transparency and coherence but also facilitates ongoing adjustments to the evaluation approach as new insights emerge.

By aligning the information flow with targeted techniques and instruments, the COCOON evaluation plan ensures a robust and systematic approach to assessing the project's outcomes. The integration of digital platforms, visual tools, and analytical frameworks enhances the accuracy, efficiency, and interpretability of the evaluation process. These phases work together to provide a comprehensive understanding of participant experiences, technical quality, and project opportunities, ultimately supporting evidence-based decision-making and continuous improvement.

# Cocoon  Information Flow

|  | PRE-PILOT | Abstract Conceptualization | Active Experimentation | Concrete Experience | Reflective Observation | POST-PILOT |
|---|---|---|---|---|---|---|
| Satisfaction |  | Survey 02 | Survey 02 | Survey 02 | Survey 02 | Survey 02 |
| Technical Quality |  | Survey 02    Observation Script | Survey 02    Observation Script | Survey 02    Observation Script | Survey 02    Observation Script | Survey 02 |
| Emotional Journey |  | Observation Script    Canvas Script | Observation Script    Canvas Script | Observation Script    Canvas Script    In-depth Script | Observation Script    In-depth Script |  |
| Competences | Survey 01    In-depth Script | Survey 01    Canvas Script | Survey 01    Canvas Script | Survey 01    Canvas Script    In-depth Script | Survey 01    In-depth Script | Survey 01    In-depth Script |
| Usability | Survey 01    In-depth Script | Survey 01    Canvas Script | Survey 01    Canvas Script    In-depth Script | Survey 01    Canvas Script    In-depth Script | Survey 01    In-depth Script | Survey 01    In-depth Script |

**Evaluation Report:**
Stage data Analysis
Improvement feedback

**Evaluation Report:**
Stage data Analysis
Improvement feedback

**Evaluation Report:**
Stage data Analysis
Improvement feedback

**Evaluation Report:**
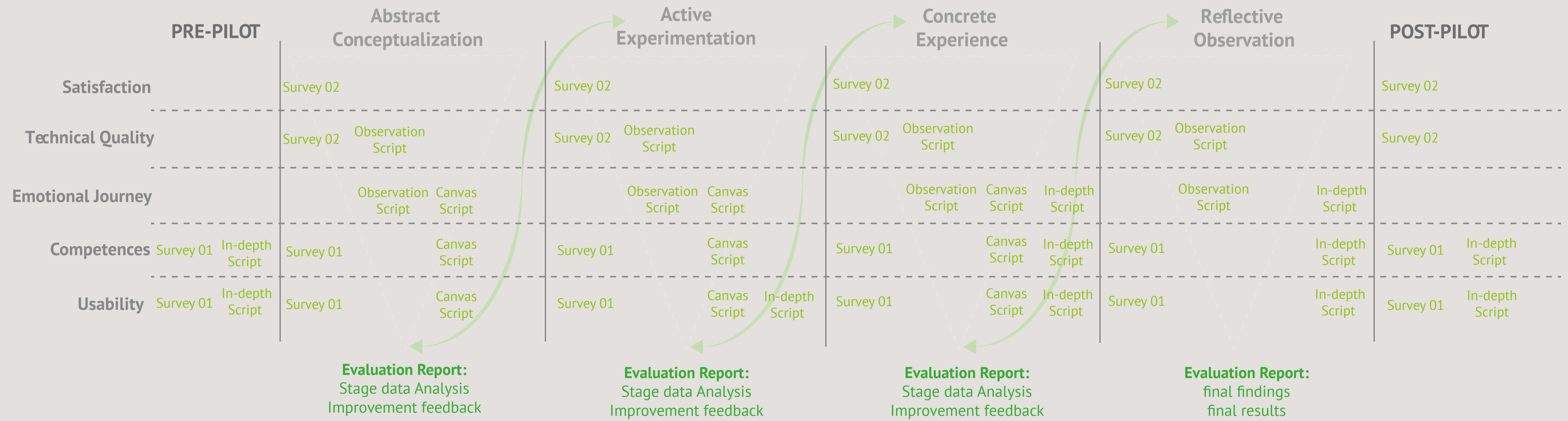final findings
final results

*Figure - Crossing Methodology Stages; Variables and Instruments, Source: the authors*

# CONSTRUCT OF THE EVALUATION PLAN

## Research Design Instruments in the COCOON Evaluation Plan

The COCOON EU Research Project Evaluation Plan employs a comprehensive set of research design instruments to ensure the systematic collection, analysis, and interpretation of data. These instruments are designed to assess key dimensions such as competencies and skills acquisition, satisfaction, technical quality, emotional journeys, and biomodule usability. To accommodate the diverse contexts of each partner, the instruments are adaptable and can be parametrized according to specific project needs, Living Lab typologies, and participatory culture backgrounds.

### Surveys

Two surveys form the core of the evaluation process, offering structured and measurable data collection.

•**Survey 01-** focuses on evaluating participants' "competencies and skills acquisition". It is implemented across three distinct phases - "pre", "during", and "post" the Living Lab - to assess the progression of skill development and knowledge transfer over time. This longitudinal approach enables the identification of changes and impacts resulting from participants' engagement with the Living Lab activities.

•**Survey 02** - addresses "Satisfaction and Technical Quality" and is conducted "during" the Living Lab sessions. This survey gathers participants' real-time feedback on their satisfaction levels, their ability to engage, and their evaluation of the tools and methodologies used. Together, these surveys provide robust, quantitative insights into the project's effectiveness and participants' experiences.

### Observation Script

The "Observation Script" is an essential qualitative tool that guides evaluation plan observers in documenting participants' involvement and emotional journeys during the Living Lab sessions. Observers use the script to focus on key aspects such as participants' levels of engagement, responsiveness to session activities, and emotional dynamics (e.g., moments of happiness, uncertainty, or disengagement). This instrument ensures systematic ethnographic observations, producing rich contextual data that complement the findings from the surveys. The combination of structured notes and visual documentation, such as images, enhances the depth of insights into participants' behaviors and interactions.

### Canvas Script

The "Canvas Script" consists of COCOON's "infographic canvases", which are designed for use in participatory workshops and Living Lab sessions. These tools enable participants to collaboratively map ideas, visions, and reflections in a visual and interactive format. The canvases facilitate group discussions and knowledge co-creation, providing a platform for participants to express their views and experiences. This method not only fosters active engagement but also generates tangible outputs that can be analyzed to identify key themes, opportunities, and challenges within the project.

### In-Depth Interviews Script

The "In-Depth Interviews Script" serves as a qualitative instrument to gain a deeper understanding of specific evaluation dimensions, particularly "competencies and skills acquisition" and "biomodules usability". The interviews are conducted with participants after the Living Lab sessions to gather detailed insights into their learning experiences, the effectiveness of the Living Lab methodologies, and the usability of biomodules. This instrument allows evaluators to explore participants' reflections, perceived improvements, and any challenges they faced during the process. The interviews provide nuanced perspectives that complement the survey and observational data, contributing to a holistic evaluation of the project outcomes.

The COCOON evaluation plan integrates these research design instruments to capture both quantitative and qualitative data systematically. The flexibility for each partner to adapt and parametrize these tools ensures that the instruments remain contextually relevant and responsive to diverse participatory settings. This comprehensive and adaptable approach enhances the accuracy, reliability, and depth of the evaluation, supporting evidence-based insights to guide future project implementation and improvements.

| Surveys | | DescriptionT | ypeC | ode |
|---|---|---|---|---|
| 01 | Competences and Usability | Evaluates entrance competences and skills. Acquired competences during the Living Labs - GAP fulfilled | Google Forms survey | **Survey 01** |
| 02 | Satisfaction and Technical Quality | Evaluates the levels of satisfaction with the Living Labs, the methods and tools used and the participant self-expression | Google Forms survey | **Survey 02** |
| **Scripts** | | | | |
| 03 | Observation | Written guideline for the COCOON Team observers. Gives instructions about the observers role, what to pay attention, take notes and how to interact with participants | PDF - accessible on COCOON drive | **Observation Script** |
| 04 | Infographics Tools | Graphic guideline for the COCOON Evaluation Team. It's a set ethnographic tools with instructions to be use in the Collaborative Participatory Sessions | PDF - accessible on COCOON drive. | **Canvas Script** |
| 05 | In-depth Interviews | Interview Semi-structure Script, with visual tools support, and Interviewer instructions and reccommnendations, to be used in the In-Depth Interviews. Pre, During, Post. | PDF - accessible on COCOON drive. | **In-Depth Script** |

*Figure - COCOON's Evaluation plan Instruments; Variables and Instruments, Source: the authors*

## Conclusion

## Crossing COCOON's Deliverables on Work Package 3 – D3.2, D.3.3 and this Evaluation Plan – D.3.5

The COCOON Evaluation Plan was meticulously designed with a foundation built upon the outcomes of "Work Package 3 (WP3)" deliverables, ensuring alignment with the project's overarching goals. The first key deliverable, "D3.2", focuses on the development of the educators' curriculum. This deliverable laid the groundwork for understanding the critical competencies and pedagogical approaches required to train educators effectively. By incorporating insights from D3.2, the evaluation plan measures not only participants' satisfaction and technical engagement but also the impact of these curricula on educators' skills development. The evaluation instruments, such as pre- and post-competency surveys and in-depth interviews, assess the degree to which educators acquire and implement new knowledge, skills, and methodologies to facilitate Living Lab activities.

The second deliverable, "D3.3", centers on the creation of COCOON's teaching and learning methodology tailored for the student curriculum. This deliverable is critical as it integrates COCOON's innovative pedagogical approaches aimed at fostering competencies in biodesign, biomaterials, and sustainable design practices. The evaluation plan aligns with these goals by systematically assessing the effectiveness of the methodologies and tools introduced through the Living Labs. Surveys and qualitative tools, such as the Canvas Script and in-depth interviews, provide data on how students engage with these methodologies, the extent of their skill acquisition, and the overall quality of the learning experience. This evaluation process ensures that the teaching and learning methods outlined in D3.3 are critically examined, validated, and refined as needed to meet the project's objectives.

The evaluation plan also supports COCOON's broader objectives of creating structured programs for "seminars, advanced training modules, higher education courses (degree and master levels), certifications for VETs (Vocational Education and Training), and lifelong learning opportunities" for design professionals. By evaluating participants' satisfaction, competencies acquisition, and the usability of tools such as biomodules, the plan ensures that these programs effectively meet the needs of diverse learner groups. The findings will provide evidence-based insights to inform curriculum development, teaching methodologies, and the design of lifelong learning pathways. As such, the evaluation plan not only validates the outcomes of WP3 but also contributes to COCOON's mission of upskilling professionals and fostering innovation in biodesign and supporting the green transition EU efforts
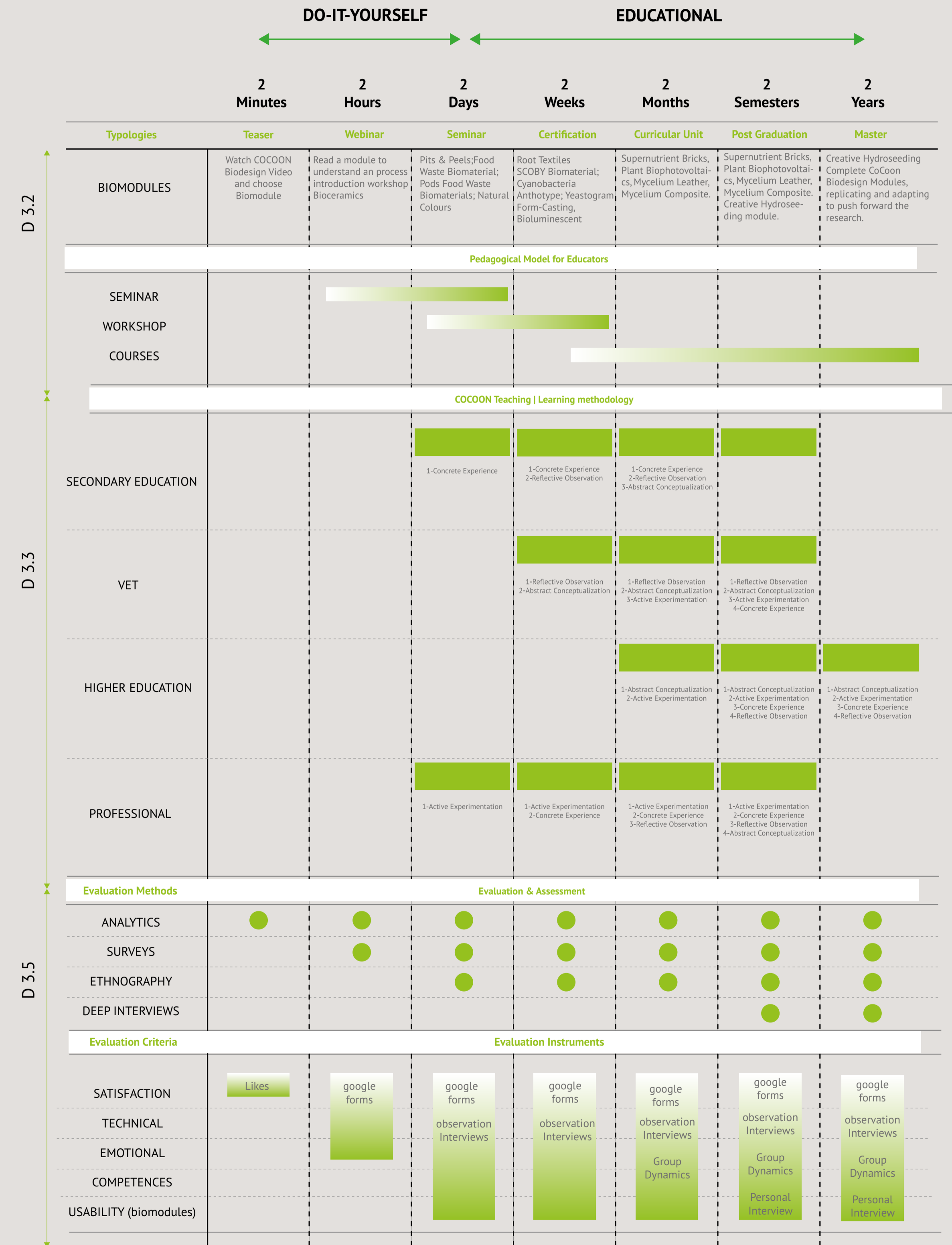


Figure - Crossing COCOON's D3.2, D.3.3 and the Evaluation Plan, Source: the authors

# APPENDIX _Surveys

**Survey 02 – Satisfaction and Technical Quality**

Please provide your opinion on the following questions/statements.

**Section A: Session | Stage | Living Lab Evaluation**

A1 - Do you consider the Session to have been dynamic?

1 - Not dynamic at all
2 - Not dynamic
3 - Neutral
4 - Dynamic
5 - Very dynamic

A2 - How would you rate the technical quality of the Session?

1 - Very poor
2 - Poor
3 - Neutral
4 - Good
5 - Very good

A3 - Are you satisfied with the Session?

1 - Not satisfied at all
2 - Not satisfied
3 - Neutral
4 - Satisfied
5 - Very satisfied

A4 - Do you consider the Session methodology/model to have been appropriate?

1 - Not appropriate at all
2 - Not appropriate
3 - Neutral
4 - Appropriated
5 - Very appropriate

A5 - Do you consider the tools used during the workshop to have been appropriate?

1 - Not appropriate at all
2 - Not appropriate
3 - Neutral
4 - Appropriated
5 - Very appropriate

**Section B: Evaluation of Engagement**

B1 - I feel that my voice was heard.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B2 - I feel that I contributed with innovative ideas.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B3 - I feel motivated to continue participating.

1 - Not motivated at all,
2 - Not Motivated
3 - Neutral
4 - Motivates
5 - Very motivated

B4 - The Session / Stage / Living Lab increased my interest and confidence in using biodesign and biomaterials in real-world applications.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B5 - I believe that biodesign and biomaterials have significant potential to contribute to sustainable solutions in my area of work or study.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

**Section C: Sharing and Referring to Others**

C1 - I feel motivated to share the methodology with my colleagues.

1 - Not motivated at all,
2 - Not Motivated
3 - Neutral
4 - Motivates
5 - Very motivated

C2 - I would recommend the session / stage / living Lab model, tools, and methods to others who might benefit from it

1 - Not motivated at all,
2 - Not Motivated
3 - Neutral
4 - Motivates
5 - Very motivated

C3 - I would like to become an internal ambassador for Biodesign.

1 - Not interested at all
2 - Not interested

3 - Neutral
4 - Interested
5 - Very interested

C4 - I will share the Biodesign methodology with parents, educators, and friends.

1 - I will not share et all
2 - I will not share
3 - Neutral
4 - I will share
5 - I will definitely share

C5 - I feel motivated to share the knowledge and learnings from the workshop with my colleagues, friends, or community.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

**Survey 01 – Competences Acquisition and Biomodules Usability**

Please provide your opinion on the following questions/statements.

**Section D: Competences and Skills Acquired – Biodesign and Biomaterials**

A1 - The Living Lab enhanced my understanding of sustainability principles and their application in biodesign and biomaterials.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

A2 - I developed new skills to creatively design solutions using biomaterials in alignment with sustainable practices.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

A3 - I feel confident in applying systems thinking to address sustainability challenges through biodesign and biomaterials.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

A4 - The living lab enabled me to collaborate effectively with others to co-create innovative solutions using biomaterials.

1 - Strongly disagree

2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

A5 - I gained the ability to critically evaluate and reflect on the environmental impact of design choices involving biomaterials.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

**Section E: Evaluation of Biomodules Implemented**

B1 - The Biomodules guidelines and instructions were clear, easy to understand, and user-friendly.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B2 - The content and recipes provided in the Biomodules are relevant and applicable to real-world biodesign and sustainability challenges.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B3 - The Biomodules effectively support the development of practical skills and competences in biodesign and biomaterials.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B4 - The recipes and instructions within the Biomodules are engaging, enabling creativity and experimentation with biomaterials.

1 - Strongly disagree
2 - Disagree
3 - Neutral
4 - Agree
5 - Strongly agree

B5 - Do you consider the solutions presented in the Biomodules to be student | apprentice-centered?

1 - Not student | apprentice-centered at all
2 - Not student | apprentice-centered
3 - Neutral
4 - Student | apprentice-centered
5 - Very student | apprentice-centered Observation Protocol for COCOON EU Research Project Evaluation Plan

# Observation Script

## 1. Introduction

The purpose of this protocol is to guide the COCOON Evaluation Team in the preparation, implementation, and data collection processes through ethnographic observation methods. This approach will complement the data gathered through other instruments, such as surveys, interviews, and workshops, to provide a comprehensive evaluation of the Technical Quality of the Living Labs and the Emotional Journey of the participants. Ethnographic observation enables evaluators to capture real-time, context-specific, and nuanced information about participant engagement, reactions, and the quality of interactions within the Living Lab environment.

## 2. Preparation for Ethnographic Observation

To ensure consistent and systematic data collection, the COCOON Evaluation Team must undertake the following preparatory steps:

•**Define Observers' Roles and Responsibilities:**

Assign observers to specific sessions or activities. Each observer is responsible for maintaining neutrality, ensuring minimal intrusion, and capturing detailed notes and images.

•**Develop Observation Guidelines:**

Prepare an observation script to ensure alignment with the research focus, emphasizing the following key dimensions:

o Technical Quality: Evaluation of session flow, clarity of instructions, effectiveness of tools and methods, and participant engagement.

o Emotional Journey: Identification of participants' emotional states (e.g., moments of confidence, confusion, motivation, frustration, happiness).

•**Prepare Tools and Instruments:**

o Observation Log/Checklist: Structured templates to document specific variables (e.g., interactions, reactions, emotional cues).

o Field Notes Template: A format for detailed qualitative descriptions of observations.

o Photographic Evidence: When permitted, images may be used to complement field notes (e.g., images of participants interacting with tools or collaborative outputs).

•**Training Observers:**

Conduct preparatory sessions to ensure that observers are familiar with the guidelines, tools, and ethical considerations. Training should include identifying emotional cues, taking structured notes, and maintaining objectivity.

## 3. Guidelines for Ethnographic Observation

The observation process should follow a structured approach to ensure focus on the evaluation goals. Observers must adhere to the following guidelines:

•Be a Passive Observer: Minimize interaction with participants to avoid influencing behaviors.

•Focus on Key Dimensions:

o Technical Quality: Observe the clarity and usability of tools, materials, and instructions provided to participants. Note any disruptions, ambiguities, or moments of participant confusion and engagement. Pay attention to participants' ability to express themselves and their ideas.

o Emotional Journey: Monitor participants' visible emotional states (e.g., facial expressions, body language, tone of voice). Identify moments when participants appear highly engaged, frustrated, motivated, or satisfied.

•Capture Contextual Information: Document the environment, group dynamics, and external factors that may influence participants' experiences.

•Use Time Markers: Log observations with time stamps to facilitate later analysis, ensuring a chronological flow of data.

## 4. Tools and Methods for Data Collection

To ensure comprehensive data capture, the following tools and methods will be employed:

1. **Observation Log/Checklist:**

A structured template designed to evaluate:

o Participant interactions with tools, guidelines, and facilitators.

o Levels of engagement and technical flow of the Living Lab sessions.

o Emotional expressions and critical moments (positive and negative).

**Example Variables:**

o Participant actively collaborating with tools.

o Participant showing confusion or disinterest.

o Participant expressing ideas confidently or enthusiastically.

2. **Field Notes:**

Qualitative notes providing detailed descriptions of observations, including specific participant quotes, actions, and interactions that highlight emotional states or technical quality issues.

3. **Images or Visual Evidence:**

Observers may capture images (with prior consent) of participants engaging with tools or outputs, illustrating critical observations such as collaboration, experimentation, or emotional expressions.

4. **Mapping Emotional Journey:**

Observers will highlight key emotional states during each session phase (e.g., initial uncertainty, growing confidence, enthusiasm). Use of simple visual tools, such as emotional journey maps, can help document these shifts.

## 5. Data Analysis and Reporting

Following data collection, observers must ensure the systematic organization of observation logs, field notes, and visual evidence to facilitate analysis. Key analysis methods include:

•Thematic Analysis: Identify recurring themes regarding technical quality (e.g., usability issues, engagement) and participants' emotional journeys (e.g., moments of satisfaction, frustration, or excitement).

•Contrast Analysis: Compare positive and negative observations to identify strengths and areas for improvement within the Living Lab structure.

•Integration with Other Instruments: Triangulate ethnographic observations with survey results, interviews, and workshop outputs to provide a holistic evaluation.

Reporting Format: Observers will summarize findings into clear sections, including:

•Technical Quality Observations: Usability, effectiveness, and participant engagement.

•Emotional Journey Observations: Patterns of emotional states and their impact on participants' experiences.

•Key Insights and Recommendations: Suggestions to improve methodologies, tools, or session dynamics.
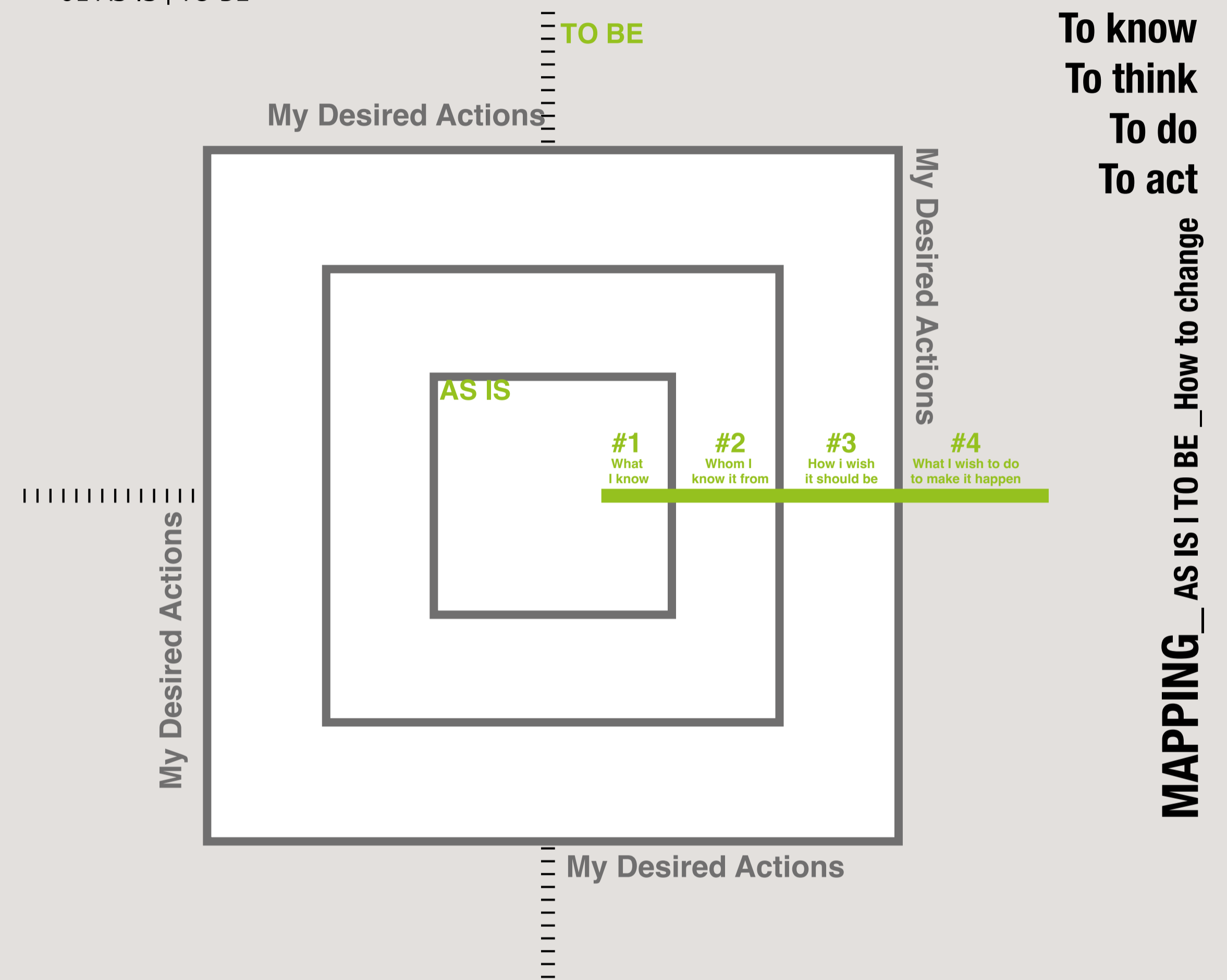
### 6. Ethical Considerations

To ensure ethical compliance during ethnographic observation:

•Obtain informed consent from participants prior to data collection.

•Guarantee confidentiality and anonymity of participants.

•Minimize intrusion and respect participants' comfort and autonomy during observation.

•Use images or direct quotes responsibly, ensuring consent and relevance to evaluation goals.

### 7. Conclusion

This protocol serves as a guide to systematically collect ethnographic observation data that complements other evaluation methods. By focusing on the Technical Quality and Emotional Journey dimensions, the COCOON Evaluation Team will gain valuable insights into participants' experiences, enabling a robust and comprehensive evaluation of the Living Lab implementation.

## Canvas Script_ Infographic Canvas for Living Labs Ethnographic Research

01 AS IS | TO BE

**TO BE**

**My Desired Actions**

**My Desired Actions**

**AS IS**

#1
What I know

#2
Whom I know it from

#3
How i wish it should be

#4
What I wish to do to make it happen

**My Desired Actions**

**My Desired Actions**

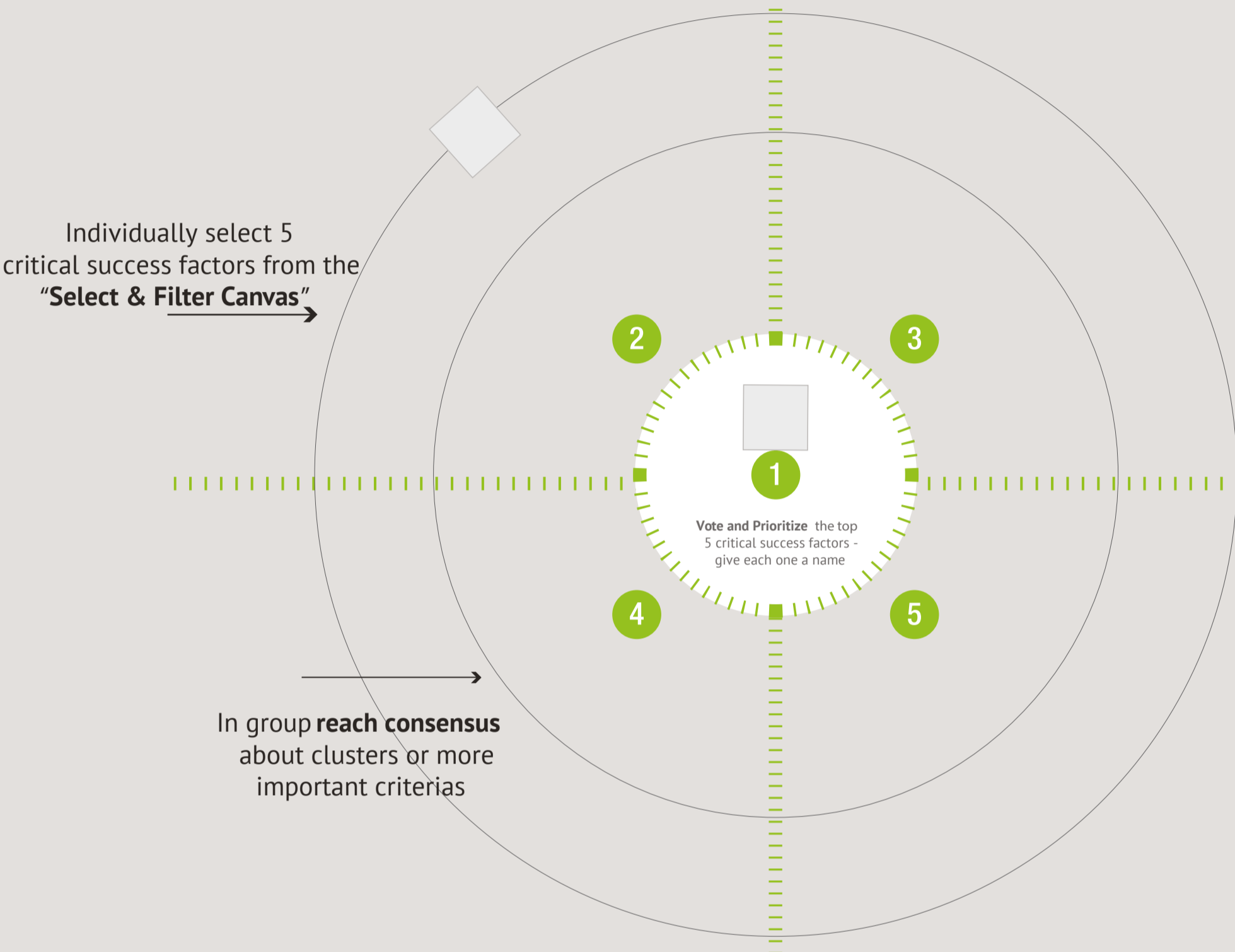To know
To think
To do
To act

MAPPING_ AS IS I TO BE _How to change

Instructions
Size: A1
Duration: 30 Minutes

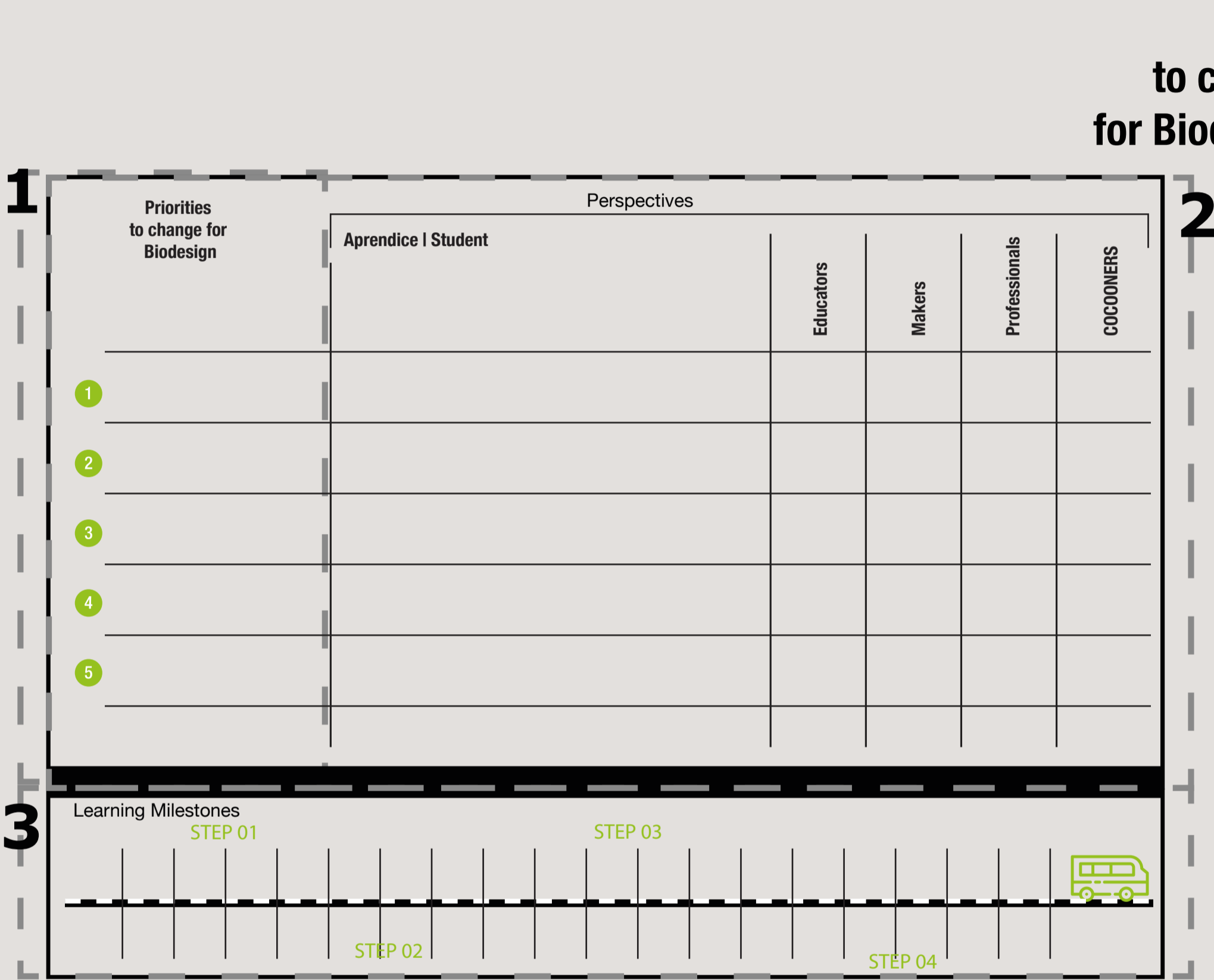**Canvas Script_** Infographic Canvas for Living Labs Ethnographic Research

02 PRIORITIZING

**What is Critical?**

**ANALIZE_ Critical Success factors to LLbs**

Individually select 5
critical success factors from the
"**Select & Filter Canvas**"

2          3

1

**Vote and Prioritize** the top
5 critical success factors -
give each one a name

4          5

In group **reach consensus**
about clusters or more
important criterias

Instructions
Size: A1
Duration: 30 Minutes

**Canvas Script_** Infographic Canvas for Living Labs Ethnographic Research

03 SYSTEMIZING

**Steps
to change
for Biodesign**

**SYSTEMS_ Stepping-stones for Change**

**1**

| Priorities to change for Biodesign | Perspectives | | | | | |
|---|---|---|---|---|---|---|
| | Aprendice \| Student | | | Educators | Makers | Professionals | COCOONERS |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |

**2**

**3** Learning Milestones

STEP 01          STEP 03

STEP 02          STEP 04

Instructions
Size: A1
Duration: 45 Minutes

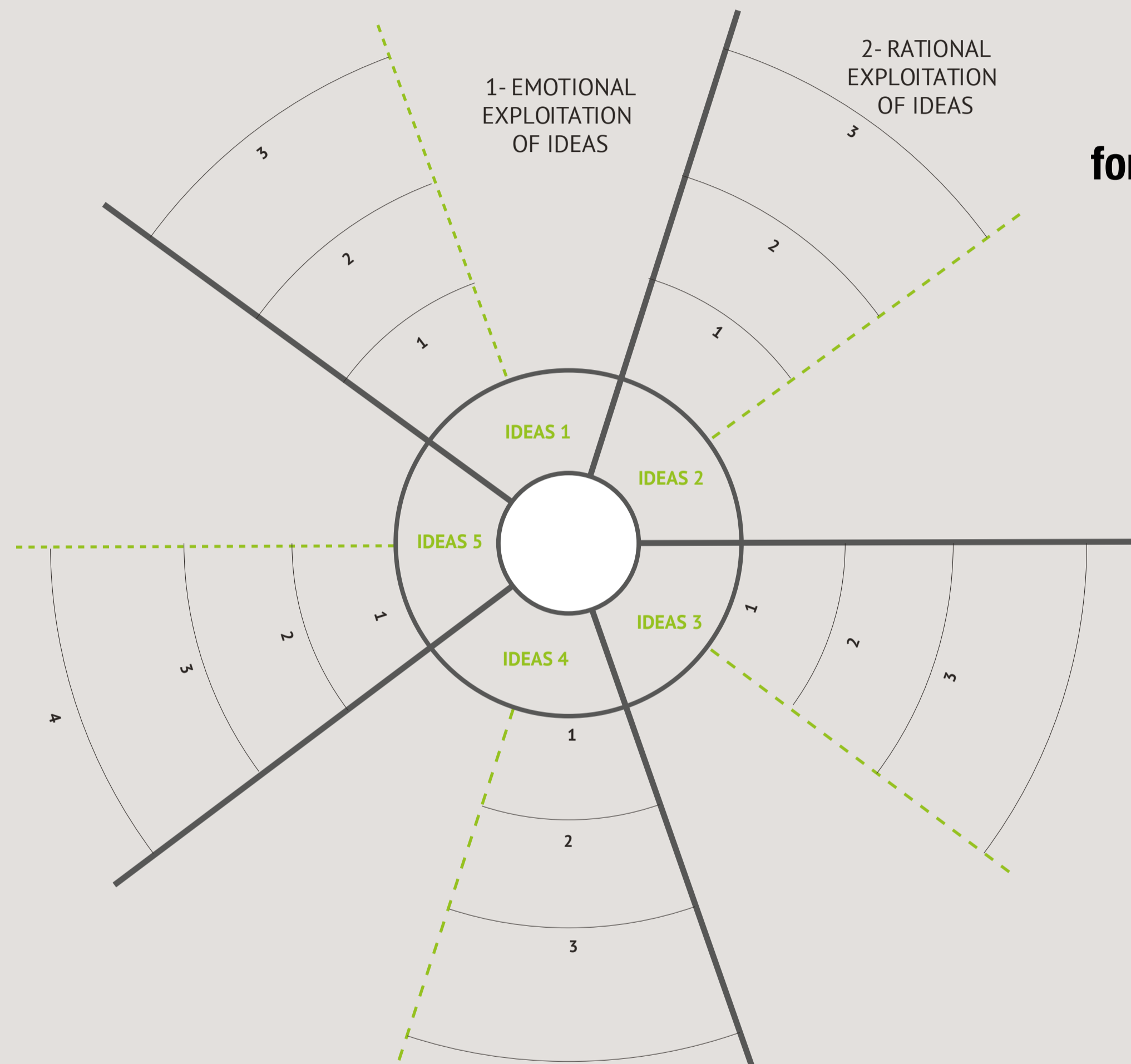## Canvas Script_ Infographic Canvas for Living Labs Ethnographic Research

04 GENERATING



1- EMOTIONAL EXPLOITATION OF IDEAS

2- RATIONAL EXPLOITATION OF IDEAS

**Generate Ideas for Biodesign**

IDEAS 1
IDEAS 2
IDEAS 5
IDEAS 3
IDEAS 4

**GENERATE_**Co-creation & Co-design

Instructions
Size: A1
Duration: 45 Minutes

## In-depth Interviews Script_

In-depth Interview Protocol for COCOON EU Research Project Evaluation Plan

### 1. Introduction

The purpose of this protocol is to guide the COCOON Evaluation Team in the preparation, implementation, and data collection processes for in-depth interviews. This method aims to complement data collected through other evaluation instruments (e.g., surveys, observations) by enabling detailed, qualitative insights into participants' experiences. Specifically, the interviews will focus on gathering information about:

1. **Competences and Skills Acquisition:** Participants' perceptions regarding the competences and skills developed during the Living Labs, aligned with **GreenComp** competences and competencies in **Biodesign and Biomaterials.**

2. **Biomodules Usability:** Participants' evaluation of the structure, content, guidelines, recipes, and overall usability of the Biomodules developed within the COCOON project (D3.4).

### 2. Preparation for In-depth Interviews

#### 2.1 Objectives and Scope

The interviews aim to:

- Identify the specific competences and skills participants acquired during their engagement with the Living Labs.
- Evaluate the participants' ability to apply these competences in real-world biodesign and biomaterials contexts.
- Assess the usability and effectiveness of the Biomodules, including clarity of guidelines, relevance of content, accessibility, and alignment with learning objectives.

#### 2.2 Participant Selection

- Target Group: A purposive sample of Living Lab participants, including educators, students, makers, and design professionals.
- Criteria for Selection:
  - o Participants who engaged with the Biomodules extensively.
  - o Participants with diverse levels of prior knowledge in biodesign and biomaterials.
  - o Individuals who can provide detailed reflections on their learning experiences and usability of the tools.

#### 2.3 Scheduling and Setting

- Timeframe: Interviews should be scheduled shortly after the Living Labs to ensure accurate recall of experiences.
- Duration: Each interview should last approximately 45–60 minutes.
- Setting: Interviews can be conducted in-person or online via platforms such as Zoom, ensuring a private and comfortable environment for open discussion.

#### 2.4 Tools and Materials

- Interview Guide: A structured script with open-ended questions focusing on competences, skills acquisition, and Biomodules usability.
- Recording Tools: Audio/video recording devices (with participants' consent) to ensure accurate data capture.
- Field Notes Template: Observers' notes for documenting non-verbal cues, key insights, and contextual information.

### 3. Guidelines for Conducting In-depth Interviews
The following steps outline the process for conducting in-depth interviews:

### 3.1 Pre-Interview Preparation
•Obtain informed consent from participants, including permission to record the session.
•Provide a brief explanation of the interview objectives, the use of data, and the importance of their insights.
•Prepare the interview guide with core questions and follow-up prompts to ensure focus and flexibility during the discussion.

### 3.2 Interview Process
The interviews will follow a semi-structured format to allow for both guided and exploratory conversations:

1. **Opening Phase (5–10 minutes):**
   o Greet the participant warmly and create a comfortable atmosphere.
   o Briefly explain the purpose of the interview and remind participants of confidentiality.
   o Confirm their consent to record the interview.

2. **Core Interview Phase (30–45 minutes):**
   The following key topics will guide the discussion:

   **a. Competences and Skills Acquisition**
   o What new competences or skills do you feel you have acquired through the Living Labs?
   o How do these competences align with your professional or educational goals?
   o Can you describe specific moments or activities where you developed these skills?
   o How confident are you in applying these skills in biodesign or biomaterials contexts?

   **b. Biomodules Usability**
   o How would you evaluate the structure and clarity of the Biomodules (e.g., guidelines, instructions, recipes)?
   o Were the Biomodules' contents relevant and useful for your learning objectives?
   o Did the Biomodules support your ability to experiment and innovate with biodesign and biomaterials?
   o What improvements would you suggest to make the Biomodules more effective or user-friendly?

3. **Closing Phase (5 minutes):**
   o Thank participants for their time and valuable insights.
   o Provide an opportunity for participants to share any additional thoughts or suggestions.
   o Reiterate how their responses will contribute to the COCOON project's evaluation.

### 3.3 Post-Interview
•Immediately after the interview, review the recording and notes to ensure completeness.
•Document initial impressions and key observations while they are fresh.

### 4. Data Analysis and Synthesis
The qualitative data collected through in-depth interviews will undergo systematic analysis to identify recurring themes and patterns related to competences acquisition and Biomodules usability:

1. **Thematic Analysis:**
   o Transcribe interviews verbatim to enable detailed coding of responses.
   o Identify themes related to specific competences (e.g., problem-solving, creativity) and usability dimensions (e.g., clarity, relevance, accessibility).

2. **Contrast and Comparison:**
   o Compare responses across participants to highlight similarities, differences, and areas for improvement.

3. **Integration with Other Data Sources:**
   o Triangulate interview findings with data from surveys, observations, and group activities to strengthen the reliability of conclusions.

4. **Synthesis of Findings:**
   o Summarize key insights in relation to the evaluation plan objectives, focusing on:
      -Competence acquisition aligned with GreenComp and Biodesign skills.
      -User experience and suggested improvements to Biomodules usability.

### 5. Ethical Considerations
•Informed Consent: Participants must be fully informed about the purpose, process, and use of their data before providing consent.
•Confidentiality: Ensure that all data (audio, transcripts, notes) are anonymized and securely stored.
•Voluntary Participation: Participation in interviews is strictly voluntary, with the right to withdraw at any time.
•Data Protection: Adhere to GDPR guidelines and ethical standards in handling, processing, and reporting data.

### 6. Conclusion
This protocol provides a comprehensive framework for the COCOON Evaluation Team to prepare, conduct, and analyze in-depth interviews. By focusing on competences and skills acquisition and Biomodules usability, the interviews will generate rich, qualitative insights to complement other evaluation instruments, ultimately supporting the overall objectives of the COCOON EU Research Project.